

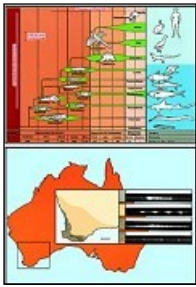
2011/12

MEDICAL & SCIENCE MEDIA

Science OVERHEADS

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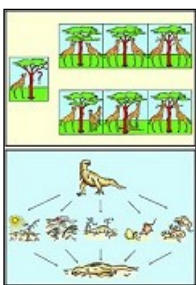
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[Cat #: JL-5ST](#)**Origin and Evolution of Life Overheads, Part 1****24 Overheads**

Atlas of 24 OHP Transparencies size 22 x 28 cm, containing 60 colour pictures, mostly with several component figures (drawings, diagrams, tables, anatomical pictures, photomicro- and macrographs, fossils, test data and results). - Compilation and text: Dr. B. Zucht.

Stellar, Chemical and Organic Evolution. Formation of Procaroynts - The temporal course of evolution: nomenclature - The temporal course of evolution: events and epoches - Origin of the celestial bodies - Origin of the solar system - Rise of light chemical elements - Rise of heavy chemical elements - Landscape of the earth in prehistoric times, scene - The prehistorical landscape as a chemical cooking-pot - Apparatus of MILLER for generation of amino acids in simulated primary atmospheres - Molecular structures of primary spheres - List of authors:

Formation of organic compounds in simulated primary atmospheres - Abiotic formation of amino acids - Abiotic formation of oligopeptids - Abiotic formation of polypeptids (proteinoids) - Abiotic formation of purine and pyrimidine bases - Abiotic formation of important bio-molecules by means of hydrocyanic acid as a result of simulated experiments - Simulated polycondensation of amino acids to proteinoids I: heated lave - Simulated polycondensation of amino acids to proteinoids II: melting, formation of steam - Simulated polycondensation of amino acids to proteinoids III: condensation reaction - Simulated polycondensation of amino acids to proteinoids IV: removing of the polymerizates - Abiotic formed proteinoidmicrospheres - Formation of co-acervates, simple 'metabolism' of co-acervates - Formation of lipid bilayer, schematic diagram - Formation of longer nucleic acid sequences - Stages of formation and decomposition of polynucleotids - Formation of polynucleotid aggregates - Concentration and formation of specific polynucleotid aggregates - Catalytic reaction net of protein molecules - Complementary reproduction and evolution of nucleic acids - Catalytic circle of protein and nucleic acid molecules. The hyper cycle according to EIGEN - Protobiotics originated from random proteins - Hypothetic propagation of protobiotics - Hypothetic evolutionary stages of reproduction of protobiotics - Early metabolic processes of eobiotics - Basic life forms of eobiotics - Evolutionary stages of metabolism I: Beginning to protobiotics - Evolutionary stages of metabolism II: Protobiotics to procaryotes - Evolutionary stages of metabolism III: Fermenting, respiring, photosynthetic protobiotics - Metabolic processes of the cell, basic scheme - Precambrian evidences of life, scheme - Itabitite. Sedimentation in reducing atmosphere - Precambrian microfossils I: Unicellular organisms of South African precambrium (about 3 000 000 000 years old) - Precambrian microfossils II: Spherical, filiform, umbrella-shaped organisms of North American gunflint formation (about 2 000 000 000 years old) and cell aggregates and cell colonies of the Australian bitterspring formation (about 1 000 000 000 years old) - Precambrian stromatolithe blue-green algae with azurite as a medium of petrification - Stromatolithe algal reefs from the museum of St. Petersburg - Simple present organisms I: Blue-green algae - Simple present organisms II: Bacteria - Evolution course of the living beings, diagram.

[Cat #: JL-6ST](#)**Origin and Evolution of Life Overheads, Part 2****24 Overheads**

Atlas of 24 OHP Transparencies size 22 x 28 cm, comprising 45 colour pictures, mostly with several component figures (drawings, diagrams, anatomical pictures, nature photographs, photomicro- and macrographs, life cycles, scenes of landscape, fossils, test data and results). - Compilation and text: Dr. B. Zucht.

The Biological Evolution from the Procaroynts to the Vegetable and Animal Kingdom -

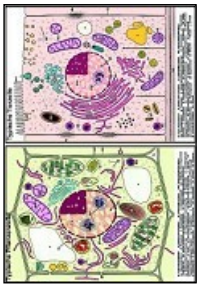
Theory of spontaneous generation and realization - Tapestry with a presentation of the Christian Genesis (12th cent.) - Pattern of the descent and ramification of the five phyla of organisms - Rise of the eucyte according to the theory of endosymbiosis - Bacterial endosymbiosis in Amoeba (Pelomyxa) - Development of flagellate eucytes to different algae and other forms of life -

Colonial forms of unicellular organisms as a pattern of the development of multicellular organisms - Development of the spore-plants from aquatic to terrestrial forms - Reconstruction of Rhynia (Psilophyta), an early terrestrial primitive fern - Evolutionary lines of terrestrial spore-plants - Evolutionary process according to the telome theory - Phylogeny of leaves according to the telome theory - Positions of sporangia according to the telome theory I - Positions of sporangia according to the telome theory II - Phylogeny of types of vascular bundles according to the stellar theory - Thin section of a fossil actinostele (Lepidodendron) - Psilotum, a present archaic fern. Protostele and actinostele - Selaginella, a moss-fern, fertile stem with sporangia, w.m. - Ginkgo biloba, ginkgo tree, leaves - Dicyema (Mesozoa), a simple animal with body and sexual cells - Gastraea theory according to HAECKEL - Notoneuralia and gastroneuralia theory according to HEIDER - Coelom theory according to REMANE - Hypothetic phylogenetic tree of Deuterostomia - Development of the abdominal cavity in the Coelomates - Evolution of the Chordates I: wormlike animal to lancet-like animal - Amphioxus (Branchiostoma lanceolatum), whole mount - Evolution of the Chordates II: vertebrates - Simplified scheme of ramifications to show the course of evolution in the

vertebrates - Morphological variety of an animal group: the evolution of the cephalopoda - Saurians: Ornithischia and Saurischia - Phylogenetic relations among saurians - Comparison of numbers of species of the animals - Course of the earth history. Geological times - Earth history. Table of formations - Cambrian period: Scene of landscape with typical animals and plants - Silurian period: Scene of landscape with typical animals and plants - Devonian period: Scene of landscape with typical animals and plants - Carboniferous period: Scene of landscape with typical animals and plants - Permian period: Scene of landscape with typical animals and plants - Triassic period: Scene of landscape with typical animals and plants - Jurassic period: Scene of landscape with typical animals and plants - Cretaceous period: Scene of landscape with typical animals and plants - Tertiary period: Scene of landscape with typical animals and plants - Quaternary period: Scene of landscape with typical animals and plants.

[Cat #: JL-7ST](#)

Origin and Evolution of Life Overheads, Part 3



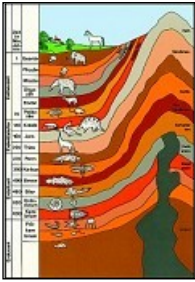
30 Overheads

Atlas of 30 OHP Transparencies size 22 x 28 cm, comprising 60 colour pictures, mostly with several component figures (drawings, diagrams, anatomical pictures, photomicro- and macrographs, life cycles, scenes of landscape, fossils, test data and results). - Compilation and text: Dr. B. Zucht.

Basis, Mechanisms and way of Evolution of the Vegetable and Animal Kingdom - Ways of evolution represented for example on the evolution of vertebrates - Morphological homologies I: Cells and cellular structures - Common structure plan of limbs of the vertebrates - Morphological homologies II: Construction plans of molluscs - Morphological homologies III: Formation of notochord and vertebrae - Morphological homologies IV: Graduation of the vertebrate brains -

Graduation of the vertebrate heart - The development of vertebrate kidneys - Graduation of the vertebrate lung - Homologies in metabolism I: Adenosine triphosphate (ATP) as an universal energy carrier - Homologies in metabolism II: Comparison between various processes of photosynthesis and chemosynthesis - Homologies in fundamental vital functions: Mitosis in onion root tips - Petrified tree-trunks in the national park 'petrified forest' Arizona USA - Petrified swordtail (Xiphosura) from the Jurassic period (Solnhofen, Germany) - Extinct linking animals: Ichthyostega and Archaeopteryx - Archaeopteryx: Reconstruction and fossil - Living fossil: Swordtail Limulus (Xiphosura) - Important living fossils in invertebrates, vertebrates and vascular plants - Parallelism in the evolution between African and South American animals - Nauplius larvae of various crustacean groups - Embryonic stages of various vertebrate classes - The ancestral development of the horse foot - Foot skeletons of artiodactyla - Embryos with gill clefts. The biogenetic law after HAECKEL - Pelvic rudiments of a whale - Irregular dew-claw of a horse (atavism) - Phylogeny of behavioural pattern in ducks - Biochemical relationship of serum albumins of mammals - Theory of catastrophes according to CUVIER - The Lamarckian theory (inheritance of acquired characteristics) and the Darwinian theory (natural selection) - Modification I: Curves of variation - Different grows of two plantains, one taken from a field, the other taken from a forest - Modification II: Dissimilar growth of parts of a dandelion plant, unsuccessful selection while culturing paramaecia - Modification and mutation - Mutation I: Mutagenous effects and mutability - Mutation II: Types of mutation - Mutation III: Various frequency of gen mutations ('hot spots') - Mutation IV: Mutagenic effect by nitrous acid on DNA - Recombination in grass parakeets - Allopolyploidy in wheat - Selection I: Kinds of selection - Selection II: Natural selection and selection by man - Selection III: Cryptic appearance and warning colouration - Selection IV: Quick selection by preadaptation. Industrial melanism of peppered moth (*Amphidasys betularia*) - Selection V: Extinction of whole animal groups caused by extreme selection - Isolation I: The continental drift theory - Isolation II: Geographical and ecological isolation - The finches of Darwin as an example for endemism - Isolation III: Isolation during reproduction in frogs - Species splitting by separation - Evolution speed. Gene shift - Adaptive radiation of marsupials and mammals - The theory of evolution by synthesis. The co-operation of evolutionary factors in course of time. Genetic landscape - Transspecific evolution. Total view - Principles of the development of forms I: Improvement - Principles of the development of forms II: Gigantism - Principles of the development of forms III: Overdevelopment (hypertely) in a beetle (*Lamellicornia*) - Spiral lines of ontogeny - Evolutionary history of the horse - Phylogenetic tree based on the structural relationship of cytochrome C - Moss (Bryophytes). Life cycle with all development stages - Fern (Pteridophytes). Life cycle with all development stages - Pine (Gymnospermae). Life cycle with all development stages - The evolution of languages out of the Indo-European primitive language.

Cat #: JL-1ST

The Evolution of Life Overheads**39 Overheads**

The theory of evolution, that means the history of the descent of organisms, is regarded now as a basic, general and suggestive biological theory. The transparency atlas presents current facts and ideas in order to acquaint the student with the most important views and models of evolution. The arrangement of the series is based on a general conception. The order in principle corresponds to the description of three fundamental subjects of evolution: Problem of the self-organisation of bio-systems, the problem of the reconstruction of phylogenesis, and the problem of species variation.

CONTENTS:

- 39 Overhead-Transparencies, size 22 x 28 cm, comprising 90 colour pictures, mostly with several component figures (drawings, diagrams, anatomical pictures, photomicro- and macrographs, nature photographs, life cycles, scenes of landscape, fossils, test data and results). The colour pictures were prepared by university illustrators specialising in this field. The application of a strong, hard-wearing carrier foil warrants great durability.
- Sketch and work-sheets with semi-diagrammatic designs and texts. Teacher may take photocopies from the sheets and use for classroom work and tests.
- Brochure with depicted explanatory comments for the teacher. All in strong plastic file with ring-mechanism.

Stellar, Chemical, and Organic Evolution - The temporal course of evolution: Nomenclature, events and epoches - Origin of the celestial bodies - Origin of the solar system - Landscape in primeval times of the earth - The pre-historical landscape as a chemical cooking pot - Apparatus of MILLER for synthesis of amino acids in simulated primary atmosphere - Simulated polycondensation of amino acids to proteinoids I: Hot lava and amino acids, II: Melting, generation of steam, III: Condensation reaction, IV: Removal of the polymers - Abiogenic production of proteinoid-microspheres - Basic functions of the life of eobionts - Evolutionary stages of metabolism: Primeval mud to protobionts, protobionts to procaryotes, fermenting, breathing, and photosynthesizing procaryotes - Precambrian evidences of life - Precambrian microfossils: Protists from the South African Precambrian, ca. 3 billion years old - Spherical, filiform, umbrella-shaped organisms from the North American Gunflint-formation, and cell filaments from the Australian Bitterspring-formation - The course of evolution of the organisms, diagram.

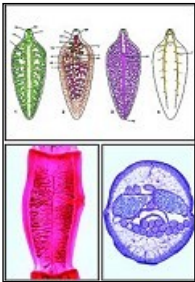
Development of Procaryotes - The Biological Evolution from the Procaryotes to the Vegetable and Animal Kingdom - Theory of spontaneous generation and realization - Tapestry with a presentation of the Christian Genesis (12th century) - Diagram of the descent and ramification of the five kingdoms of organisms - Possible development of flagellated eucytes to various algae and other life forms - Development of the spore-plants from aquatic to terrestrial forms - Evolutionary lines of terrestrial spore-plants - Hypothetical phylogenetic tree of Deuterostomia - Gastraea theory according to HAECKEL - Evolution of the Chordata: Vertebrata - Simplified scheme of ramifications to show the course of evolution in the vertebrates - Saurians: Ornithischia and Saurischia. Skulls with homologous lower jaw - Phylogenetic relations among saurians - Comparison of numbers of species of the animals - Course of the earth history. Geological times - Earth history. Table of rock formations - Morphological variety of an animal group: Evolution of the Cephalopoda - Cambrian period: Scene of landscape with typical animals and plants - Silurian period: Scene of landscape with typical animals and plants - Devonian period: Scene of landscape with typical animals and plants - Carboniferous period: Scene of landscape with typical animals and plants - Permian period: Scene of landscape with typical animals and plants - Triassic period: Scene of landscape with typical animals and plants - Jurassic period: Scene of landscape with typical animals and plants - Cretaceous period: Scene of landscape with typical animals and plants - Tertiary period: Scene of landscape with typical animals and plants - Quaternary period: Scene of landscape with typical animals and plants.

Basis, Mechanisms, and Ways of Evolution of the Vegetable and Animal Kingdom - Courses of evolution exemplified by the evolution of vertebrates - Morphological homologies: Formation of notochord and vertebrae, common structural plan of the vertebrate appendages, evolutionary stages of vertebrate brains, hearts, lungs and excretory organs - Extinct intermediate animals: Ichthyostega and Archaeopteryx - Archaeopteryx, fossil and reconstruction - Living fossils: Horseshoe crab Limulus (Xiphosura) - Important living fossils of invertebrates, vertebrates, and vascular plants - Parallel evolution of the African and South American fauna - Nauplius larvae of various crustacean groups - Embryonic stages of various vertebrate classes - The ancestral development of the horse's foot - Foot skeleton of even-toed ungulates - Embryos with gill clefts, HAECKEL'S biogenetic law - Pelvis rudiments of a whale - Irregular dewclaw of a horse (atavism) - Biochemical relationship of vertebrate serum proteins - Catastrophe theory of CUVIER, documented by "Scheuchzer's skeleton" - Lamarckism (inheritance of acquired characters) and darwinism (natural selection) - Modification: Curve of modification - Modification: unsuccessful selection in culturing Paramecium - Mutation: Mutagenous influences and mutability - Mutation: Types of mutation - Selection: Quick selection by preadaptation. Industrial melanism of the peppered moth (Biston

betularia) - Selection: Extinction of whole animal groups by extreme selection - Isolation: The continental drift theory - Isolation: Geographic and ecological isolation. Endemism of DARWIN's finches - Speciation by geographic separation - Adaptive radiation of marsupials and mammals - Forming principles: Perfection, gigantism, hypertely of a lamellicorn beetle, individual and ancestral development of stag's antlers - Transspecific evolution, diagram - Ontogenetic spirals - Evolution of the horse - Phylogenetic tree based on structural relationship of cytochrome C - Evolution of languages from the primeval Indo-European language.

Cat #: JL-23ST

Embryology of Animals Overheads



11 Overheads

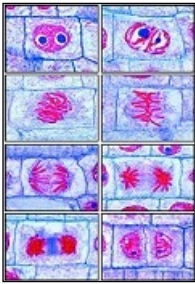
Atlas of 11 Overhead-Transparencies size 22 x 28 cm, comprising over 70 pictures (colour photomicrographs and - macrographs, colour life-cycles and anatomical pictures). With comprehensive interpretation text. In strong plastic file with ring-mechanism. - By Dr. K.-H. Meyer and Johannes Lieder.

Sea Urchin Embryology: Unfertilized eggs - Fertilized eggs - Two cells - Four cells - Eight cells - Sixteen cells - Thirty-two cells - Morula - Blastula - Blastula, beginning gastrulation - Blastula, progressive gastrulation - Pluteus larva - Sea urchin embryology, schematic graphic colour designs of all stages.

Embryology of the Frog: Uncleaved egg with jelly envelop, view to the animal pole, egg spot and polar bodies, w.m. - Beginning first division, grey crescent visible, w.m. - Two-cell stage, egg not yet completely separated, w.m. - Two-cell stage, t.s. - Four-cell stage, second groove vertical to the first one, w.m. - Four-cell stage, t.s. - Eight-cell stage, four micromeres and four macromeres, w.m. - Median section through the sixteen-cell stage - Morula, w.m. - Morula, median section, blastocoel can be seen - Blastula, w.m. - Blastula, median section, blastocoel - Gastrula, w.m. blastopore appears semicircular - Gastrula, frontal section - Early neurula, detailed view of t.s. with neural plate and primitive gut - Early neurula, w.m., the neural folds get closer - Late neurula, w.m., neural folds are closed - Late neurula, detailed view of t.s. with neural tube, somites, chorda and coelom - Early tail bud stage, eye cleft and optic stalk - Sagittal section through early neurula - Middle tail bud stage, primordia of gills - Middle tail bud stage, primordia of gills and leg bud - Tail bud stage, sagittal l.s. with forebrain, neural tube, notochord, digestive tract, heart - Tail bud stage, parasagittal l.s. showing primitive segments - Hatching stage of embryo, t.s. through head showing brain, eyes - Hatching stage of embryo, t.s. through region of heart - Newly hatched larva, w.m. shows fully developed adhesive processes, gill plumes - Newly hatched larva, parasagittal l.s. showing pronephros, Wolffian duct - Larva, t.s. through region of eyes - Larva, t.s. through region of heart - Larva, t.s. in region of stomach showing primordia of liver and stomach, pronephros and spinal cord - Older larva, frontal section through eye region, gill arches and gill clefts - Frog, the cleavage divisions, colour schematic designs - Frog, the Gastrulation, total views and sagittal sections. Schematic designs of several stages - Frog, the neurulation, dorsal views and transverse sections. Schematic designs of several stages - Frog, schematic design of the early gastrula, showing the position of the germ layers and the primordia, various organs.

Embryology of the Chicken: 24 hour, w.m. showing primitive groove, primitive node, 7 somites, and neural plate - 24 hour, t.s. through primitive groove showing formation of mesoderm - 24 hour, t.s. showing neural plate, notochord, mesoderm - 28 hour, w.m. 10 somites, primordium of heart and eyes, notochord - 36 hour, t.s. of posterior region of abdomen shows neural groove, notochord, and mesoderm - 36 hour, t.s. of anterior region of abdomen showing neural tube, notochord, the mesoderm forming myotome and splanchnotome - 40 hour, w.m. 15 somites, heart, primordium of brain - 45 hour, l.s. shows primitive node, formation of mesoderm and somites, heart, brain - 48 hour, t.s. of abdomen. Myotome, nephrotome, and splanchnotome - 50 hour, w.m. shows heart, primordium of brain and eyes, auditory vesicles, buccal cavity - 72 hour, w.m. injected to show the blood vascular system: Heart, gill vessels, aorta, venous system, extraembryonic vessels - 3 days, t.s. through posterior region of abdomen showing coelomic cavities, nephrotome - 3 days, t.s. through region of head. Primordium of brain and eyes, gill arches - 4 days, t.s. of anterior region of abdomen, pronephros, Wolff's duct - 4 days, t.s. in region of heart, primordium of wings and vertebrae - 5 days, w.m. showing formation of head, eyes, limb buds, gill arches, allantois - 8 days, l.s. with primordium of organs, heart, liver, metanephros, brain - Gallus, feather development, sec. through wings in stages of the development - Gallus, skin of body, horizontal section shows t.s. of feather quills - Gallus, t.s. through embryo of 48 and 72 hours, colour graphic design.

Cat #: JL-21ST

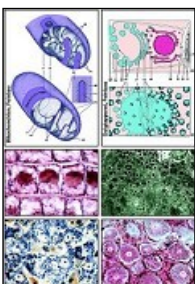
Cytology and Genetics Overheads**10 Overheads**

Atlas of 10 Overhead-Transparencies size 22 x 28 cm, comprising 67 pictures (anatomical pictures, photomicro- and macrographs, nature photographs, electron micrographs, drawings, diagrams, tables, scenes, test data and results). With comprehensive interpretation text. In strong plastic file with ring-mechanism. - By Drs. Gerlach and Lieder.

Animal Cells and Genetics: - Typical Animal Cell, showing all details visible by light and electron microscope in different colour - Squamous epithelium, isolated cells. Nuclei and cytoplasm are shown - Striated muscle l.s. showing nuclei, striations, myofibrils - Compact bone, human t.s. showing cells and canaliculi - Hyaline cartilage, human t.s. - Nerve fibres isolated, showing myeline sheaths and Ranvier's nodes - Simple animal cells in liver, t.s. with cellular membranes, nuclei, and cytoplasm - Electron micrograph of a liver cell showing nucleus, mitochondria, cytosomes, lysosomes, dictyosomes, glycogen - Phagocytosis in Kupffer's star cells of the liver, t.s. - Ovary of cat, t.s. showing primary, secondary, and Graafian follicles - Fallopian tube with embedded egg (oocyte), t.s. high magnification detail - Testis of frog, t.s. showing spermatogenesis. Spermatogonia, spermatocytes, spermatids, and mature spermatozoa - Testis of crayfish, t.s. showing meiosis and spermatogenesis - Animal mitosis, colour graphic design with 9 different stages - Reduction division during spermatogenesis in human and animals, all stages, colour graphic design - Giant chromosomes in the salivary gland of Chironomus larva, with large chromomeres. Stained for DNA - Giant chromosomes of Chironomus, colour graphic design - Human chromosomes in smear from culture of blood - Karyotype of human chromosomes - Lampbrush chromosomes of diplotene stage in living egg cell of salamander (phase contrast) - Uteri of Ascaris megalocephala, t.s. to show details of meiosis with chromosomes and nuclear spindles - Barr bodies (sex chromatin) in female squamous epithelium - Pigment cells in skin - Storage of glycogen in liver cells, sec. - Nucleus of an amoeba, live microphotograph - Mitochondria in thin sec. of kidney or liver, specially prepared and stained - Mitochondria, fine structure, colour schematic design - Golgi apparatus in sec. of spinal ganglion - Golgi apparatus, fine structure, colour schematic design - Ova from Psammechinus (sea urchin). Fertilized ovum - Ova from Psammechinus (sea urchin). Two-cell stage - Ova from Psammechinus (sea urchin). Four-cell stage - Ova from Psammechinus (sea urchin). Eight-cell stage - Inheritance of two linked genes in Drosophila: cross, backcross, linkage groups - Gene exchange between two corresponding linkage groups of Drosophila, chromosomal interpretation - Drosophila genetics, adult wild type, w.m. - Drosophila, "barr eye" mutant, w.m. - Drosophila, "brown eye" mutant, w.m. - Drosophila, "vestigial wing" mutant, w.m. - Drosophila, "white eye" mutant, w.m.

Plant Cells and Genetics: - Typical Plant Cell, showing all details visible by light and electron microscope in different colours - Electron micrograph of a plant cell with nucleus, cell walls, vacuoles, mitochondria, endoplasmatic reticulum, plasmodesma and chloroplasts - Epidermis of Allium (onion), w.m. showing simple plant cells with cell walls, nuclei and cytoplasm - Stem apex and meristematic tissue of Elodea, l.s. showing growing zone and leaf origin - Wood of Tilia macerated and w.m. showing wood cells, vessels and fibres - Root tips of Allium l.s. showing cell division (mitosis) in all stages: - Mitosis: root tip; interphase (resting stage) - Mitosis: root tip; early prophase - Mitosis: root tip; late prophase - Mitosis: root tip; early metaphase - Mitosis: root tip; equatorial plate of metaphase - Mitosis: root tip; early anaphase - Mitosis: root tip; telophase - Mitosis: root tip; reconstruction - Maturation divisions (meiosis and mitosis) in the pollen mother cells of Lilium, 18 stages, colour design - Pollen mother cells of Lilium. Early prophase (leptotene) first division (meiosis) showing chromosomes as fine threads - Pollen mother cells of Lilium. Later prophase (diakinesis) of first division (meiosis) Shortening of chromosomes - Pollen mother cells. Metaphase and anaphase of first division (meiosis) showing nuclear spindles and contracted chromosomes - Pollen mother cells. Second division, interkinesis, four cells stage - Plasmodesmata, in t.s. of palm seed - Mitochondria, thin l.s. of Allium root tips stained to show the mitochondria - Fruit of Pyrus (pear) t.s. showing stone cells (sclerenchyma) - Tuber of Solanum (potato) t.s. shows cork and starch grains - Cucurbita (pump-kin) l.s. of stem showing vascular bundles with sieve tubes, spiral and annular vessels, sclerenchyma fibres - Ricinus endosperm t.s. showing aleurone grains - Ovary of Lilium (lily), t.s. showing arrangement of ovules and embryosac - Spirogyra, green alga, showing conjugation stages and formation of zygotes.

Cat #: JL-3ST

Cytology and Molecular Genetics Overheads**46 Overheads**

Atlas of 42 OHP Transparencies size 22 x 28 cm, comprising 142 colour pictures, often with several component figures (drawings, diagrams, tables, anatomical pictures, photomicrographs and macrographs, electron micrographs, autoradiographs, test data and results). - Compilation and text: Dr. Heinz Streble and Dr. Horst Boehnke.

Cell Nucleus and Chromosomes: This series illustrates the various structures of nuclei and chromosomes, pictures of mitosis and polyploidy, living nuclei, shape of nuclei and function, giant

chromosomes, polyploidy, fine structure of nuclei, chromosome structure, mitosis, individuality of chromosomes. - Typical animal cell, showing all details visible by light and electron microscope - Typical plant cell, showing all details visible by light and electron microscope - Nuclei of the alga *Spirogyra* and of an amoeba, live - Onion epidermis: position of nucleus in plant cell, live (phase contrast) - Onion epidermis: fixed and stained nucleus - Nuclear membrane of a plant cell, tetrazyclin-fluorescence - Simple animal cells in sec. of salamander liver showing nuclei, protoplasm, and cell walls - Nuclear equivalents in bacteria, acridinorange-fluorescence - Chromato- and centropiasm in blue-green algae (*Oscillatoria*), fluorescence - Metabolically active nucleus (interphase nucleus) of *Vicia faba*. Chromocentres, chromonemata, centromeres - Lampbrush chromosomes of diplotene stage in living egg cell of salamander (phase contrast) - Polytene giant chromosomes: nucleus from salivary gland of *Chironomus* larva, live - Sex chromosomes: spermatozoa without and with X-chromosomes from testis of a locust - Arrangement and shape of nuclei due to tissue functions: nuclei of connective tissue, chains of nuclei in skeletal muscles - Nuclear volume and size due to activity: epithelium of active and inactive thyroid gland - Nuclear shape in cancer cells not due to function - Polynucleate cells: giant cells of Langerhans and macrophages - Giant cell of a sarcoma - Syncytium, an undivided mass of protoplasm containing many nuclei - Position of nuclei in animal cells, classes of nuclear size - Polyploid nuclei: intestinal epithelium of an insect - Chromosomes during mitosis, squash preparation of *Allium* root tip DNA stained by Feulgen - Polyploid nuclei: polyploid chromosome sets of cultivated plants - Enlargement of nuclear surface: nucleus of a suctorian and giant nuclei in endocrine organs - Pigment cells in the skin - Motor nerve cell shows nucleus, nucleolus, Nissl's granules, and nerve processes - Glandular epithelium, t.s. showing goblet cells - Fine structure of the nucleus: nuclear membrane, nuclear content, nucleoli, electron micrograph - Ditto: nuclear membrane and RNA exit, electron micrograph - Ditto: fibrillar structure of chromosomes, electron micrograph - Rearrangement of nuclei in spermatozoa, electron micrograph - Mitochondria in thin sec. of amphibian liver - Mitochondria in plant cells, high magnification detail - Mitochondria, diagram - Golgi apparatus in epithelial cells - Golgi apparatus in secretory cells, electron micrograph: endoplasmatic reticulum and dictyosomes - Golgi apparatus, diagram - Chloroplasts with grana from cells of *Tradescantia*, bright field - Ditto. fluorescence - Chloroplasts, electron micrograph, mesophyll cell: cell walls, vacuole, chloroplasts, grana of plastids - Ditto: chloroplast showing starch, grana and thylakoids - Ditto: chloroplast; highly magnified cut-out with details in grana, thylakoids, ribosomes - Chloroplasts, diagram - Amitosis (direct division), division of nucleus and cell body without appearance of chromosomes, t.s. of liver - Amitotic division of the nucleus of *Amoeba proteus* - *Paramecium* in binary fission. Simple form of reproduction - *Paramecium* in conjugation. A temporary union of two individuals during which nuclear material is exchanged - *Paramecium*, common ciliate, anatomy, diagram - *Amoeba proteus*, habit, cyst, feeding, division, diagram - Cell division (mitosis) in animals, nine subsequent stages, diagram - Cell division (mitosis) in root tips of onion, eight subsequent stages, diagram - Mitosis: root tip of *Allium cepa*; all stages in one picture - Mitosis: root tip of *Hyacinth*; metabolically active nucleus and early prophase - Mitosis: root tip of *Hyacinth*; prophase and early metaphase - Mitosis: root tip of *Hyacinth*; equatorial plate and early anaphase - Mitosis: root tip of *Hyacinth*; telophase and reconstruction - Mitosis: chromatid bridges with fragment during anaphase - Centrioles, centrospheres, spindle fibres: meiosis of an egg cell - Mitosis: fine structure of spindle apparatus and chromosomes, electron micrograph - Comparison of haploid and diploid chromosome sets of various plants and animals, diagram - Human chromosomes during metaphase (equatorial plate) - Normal karyotype with GAG banding pattern - Individuality of chromosomes I. Male and female pronucleus of *Ascaris*, chromosomes of pronuclei - Individuality of chromosomes II. First cleavage spindle, first cleavage. - Follicles in mammalian ovary: Young primary follicles with flat epithelial cells t.s. - Ditto: Older primary follicle with higher epithelial cells t.s. - Ditto: Secondary follicle with stratified epithelium t.s. - Ditto: Young Graafian follicle, showing formation of a vacuole l.s. - Ditto: Older Graafian follicle, showing large vacuole, discus proligerus and oocyte l.s. - Ditto: Mature oocyte with membrana pellucida and corona radiata t.s. - Sea-urchin development: Uncleaved egg, before fertilization. Large nucleus - Ditto: Uncleaved egg, after fertilization. A fertilization membrane becomes visible - Ditto: Two-cell stage. Formation of two equal blastomeres after the first cleavage - Ditto: Four-cell stage, polar view.

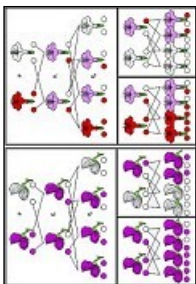
Chromosomes and Genes: Nuclei and chromosomes are conspicuous structures of cells. The part they play in cellular activities, their function and importance in heredity and cell division, as well as their molecular-biological aspects are treated in part II and III of this atlas. - Structure of chromosome: diagram of a chromosome seen under the light microscope - Giant chromosomes of *Chironomus*, diagram - Structure and activity of chromosomes: loop complex of a chromosomal puff in polytene chromosome of *Chironomus*. - Chromosomes: giant chromosomes of *Chironomus*, DNA-RNA-staining with orceine and light green - Inheritance of two linked genes in *Drosophila*: cross, backcross, linkage groups - Gene exchange between two corresponding linkage groups of *Drosophila*, chromosomal interpretation - Oogenesis, spermatogenesis, fertilization and cleavage in animals, diagram - Gene locations (loci). Map of loci on chromosomes of *Drosophila* - Meiosis: t.s. of mammalian testis. Spermatogonia, meiosis of spermatocytes I and II, spermatids, spermatozoa - Meiosis: squash preparation of mammalian testis, orceine stain - Maturation divisions in mammals, diagram - Maturation divisions in plants (*Lilium*), 18 subsequent stages, diagrams - Meiosis and mitosis in microspore cells of *Lilium*: microspore mother cells, resting stage - Ditto: leptotene stage, chromosome threads with chromomeres - Ditto: zygotene stage, pairing of homologous chromosomes. - Ditto: pachytene stage. Termination of pairing: homologous partners are in close contact forming bivalents - Ditto: diplotene stage. Concentration and spiralization of pairs, chiasmata - Ditto: diakinesis stage. Maximal shortening of chromosomes, nucleolus dissolves - Ditto: metaphase of the first (heterotypic) division, formation of the equatorial plate - Ditto: equatorial plate, surface view showing the duplicated chromosomes - Ditto: metaphase stage, ring- and cross-shape of chromosomes, equatorial plate in lateral view - Ditto: anaphase stage. Separation of chromosomes, polar movement of dyads - Ditto: telophase, the new cell wall is formed between the two daughter cells - Ditto: metaphase of the second (homeotypic) division, two mitotic figures are present - Ditto: pollen tetrads. Four nuclei are formed after the second division, each bearing the haploid number of chromosomes. Formation of cell walls - Ditto: uninuclear microspores after the separation of the daughter cells - Ditto: telophase of the third division. The generative nucleus remains on the cell wall - Ditto: mature two nucleate pollen grain at the time of shedding.

Each pollen grain possesses a tube cell and a generative cell - Causal relations between crossing-over and chiasmata; separation of chromatid tetrads - The crossing-over: breakages, healing - Fine structure of genes: crosses of mutants of the coli phage T4 - Localization of genes in chromosomes: chromosome aberrations - Chromosome mutations: ring-chromosomes, deletions, duplications, deletion of terminal segments, inversions, translocations - Extra chromosomes: karyotype of a human with Down's syndrome (trisomy 21, mongolism) - Sex chromatin: Barr bodies (sex chromatin) in human female epithelial and nerve cells, 2 pictures - Replication: macronucleus before division in the ciliate Euplotes - Replication of chromosomes: introduction of radioactively labelled thymidine - Replication of chromosomes: distribution of radioactively labelled thymidine by mitoses - Equatorial plate showing four large chromosomes. Metaphase of first cleavage (mitosis) of Ascaris - Germ plasm, somatic cells: chromosome diminution in Ascaris.

Gene and Molecule: This series was conceived to not only present the results of research, but also to show the experimental basis, and to allow the students to take part in the intellectual process of development of science. - Topics: Providing the material structure of the gene. Structural characteristics of DNA. Identical replication as a cause of hereditary constancy. DNA, RNA and protein synthesis as causes of character formation. Genetic code and molecular mechanisms in mutations. - Specialized didactic guiding ideas: Relations between structure and function on a molecular level. Explanation of genetic observations by means of characteristics and reactions of molecules. Problematization of the results by illustration of the hypotheses, methods and experiments, which lead to the results. I. DNA, the hereditary substance - Transformation in *Streptococcus pneumoniae* - DNA-content of various cells - Hereditary substances of bacteriophages (phages) - Electron micrograph of T2 phages - Reproduction of the phage T2 - Transmission of DNA into human cells - II. Structure of DNA - Nucleotides and their components - Relative components of bases in various DNA - Hydrogen bonding between bases - Structure of the double helix - Electron micrograph of phage-DNA - Electron micrograph of sections through bacterial cells (*E. coli*) - III. Replication of DNA - Models of replication - Prediction of density of replicated DNA - Density gradient centrifugation - Replicating DNA molecule I. - Replicating DNA molecule II. - IV. DNA and RNA - Differences between DNA and RNA - Fractionation of cell components by centrifugation - Synthesizing ability of components - Function of ribosomes - Structure of ribosomes - Amino acid-tRNA-complexes - Specificity of tRNA - Kinds of RNA in the cell - Experiments with artificial messengers - Polysomes on bacterial DNA - Electron micrograph of RNA-phages - Coat protein-gene of an RNA-phage - Summary: replication, transcription, translation - V. Genetic code and mutation - Colinearity between nucleotide- and amino-acid sequence - Frame shift mutations - Triplet-binding test - The genetic code - Relations between codon and anticodon - Begin of protein synthesis - Section of phage RNA - Chemical mutagenesis - Effect of mutations - VI. Synthesis, structure, and function of proteins - Protein-synthesizing complex I - Protein-synthesizing complex II - Secondary structure of proteins: a helix - Secondary structure of proteins: β -pleated sheath - Tertiary structure of a protein: β -chain of haemoglobin - Sickle cell anaemia, erythrocytes - Molecular interpretation.

Cat #: JL-4ST

Mendelian Inheritance and Variability Overheads



32 Overheads

Atlas of 30 OHP Transparencies size 22 x 28 cm, comprising 95 colour pictures, mostly with several component figures (drawings, diagrams, anatomical pictures, photomicro- and macrographs, nature photographs, life cycles, scenes of landscape, fossils, test data and results). In strong plastic file with ring-mechanism. - Compilation: Prof. Walter Mergenthaler and OStR Heribert Schmid.

The Mendelian Laws - This series introduces into classical genetics and is intended for use in all types of schools, especially high schools. The rich material allows the teacher to select according to the special situation. - Johann Gregor Mendel - Similarity of father and son - Identical (uniovular) twins - Intermediary inheritance in *Mirabilis jalapa* (Marvel of Peru) - Backcross in

Mirabilis jalapa - Intermediary inheritance in chicken - Dominant inheritance of colour in pea flowers - Dominant inheritance of colour in pea seeds - Yields of Mendelians monohybrid crosses of peas - Dominant inheritance in stinging nettles - Dominant inheritance in corn (*Zea mays*) - Dominant inheritance in the snail *Cepaea hortensis* - Dominant inheritance in guinea pigs - Backcross of F1 in dominant inheritance - Backcross of F2 in dominant inheritance - Yields of pea crosses performed by various scientists - Dihybrid cross of peas - Distribution of characters in dihybrid cross of peas - Punnett square for dihybrid cross of peas - Backcross of dihybrid peas - Dihybrid inheritance in the snail *Cepaea hortensis* - Dihybrid inheritance in guinea pigs - Dihybrid inheritance in snapdragons - Punnett square for dihybrid cross - Distribution of characters in trihybrid crosses - Ratio of numbers in polyhybrid crosses - Distributing of parental genetic makeup to children - Genetic makeup common to a family - Additive factors - Supplementary factors in *Lathyrus odoratus* (Spanish vetch) - Polygeny in mammalian fur colour - Lethal factor in canary (*Serinus canaria*) - Lethal factor in yellow mice.

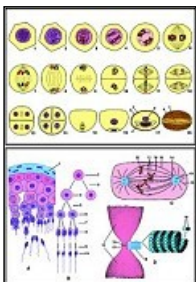
Variability Part I: The Modifications - Modificability is the changeability of the appearance or the ability of the whole genetic makeup (of the idio-type) to be expressed in the phenotype under the various developmental conditions, as well as internal and external influences. This is limited by the range of variation which itself is determined genetically. Modifications are changes of the phenotype which do not influence the idio-type. -

Development of dandelion (*Taraxacum officinale*) in mountains and lowlands (experiments of Bonnier) - Different shape of plantain (*Plantago*) growing on track across the field and on forest margin - Different shape of pine growing singly and within the forest - Modifications of leaves on one branch - Modifications of leaves of a ginkgo tree - Gentiana plants from various sea levels - Stimulating and inhibiting effects on plants - Table of binomials and Pascal's triangle - Binomial distribution or normal curve of variation for $(a+b)^4$ and $(a+b)^{10}$ - Variation curve for number of tail fin rays and lateral scales in two species of fish - Variation curve of the size in the identical progeny of a single *Paramecium* - Unsuccessful selection in culturing *Paramecia* - Fingerprints of identical twins - Starvation and mast form in sheep of the same age - Length of tadpole intestine depending on type of food - Growth speed of plaice depending on population density - Queen and worker bee, nutritional modifications - Changing modifications: biastrepic and normal *Dipsacus* plants - Spring and summer form in the butterfly *Araschnia levana* - Cooling the pupa effects the colour of butterfly wings - Change of temperature modifies colour and size of an ichneumon wasp - Temperature and light modify the colour of petunia flowers - Temperature modification in Russian rabbit - Forms transitional between submersed and floating leaves - Leaves of young and old English ivy - Sex change depending on body length of a marine annelid - Phenotypic sex determination in the worm *Bonellia* - Transplantation of frog tissue to salamander tadpole - Mossy rose gall - Pine galls produced by aphids.

Variability Part II: The Mutations - Sudden changes in animals and plants which later proved to be hereditary are called mutations. They are either spontaneous or caused by mutagens, e.g. radiation, chemical substances, or change of temperature. Mutations are highly important for the further development of life, for breeding animals and culturing plants. The possibility of curing defective genes or purposefully changing intact or defective genes means total genetic manipulation of humans and organisms. This opens a both promising and shocking, but also utopian perspective. - Normal celandine (*Chelidonium majus*) and its laciniate mutant - Leaves of various plants and their laciniate mutant - Wild-type sheep and short-legged ancon mutant - Goldfish and its mutant - Wild-type carp and its mutants - Shape and skeleton of a normal and a brachydactylous human hand - Wild-type moth (*Biston betularia*) and its carbonaria mutant. Protective colour - Industry melanism of *Biston betularia* in Great Britain - Tailless mutant of domestic cat - Beetle with duplicated legs - Biastrepis in *Dipsacus* and fasciation in Japanese spindle tree - Normal corn plants and gravitation-blind mutants - Normal snapdragon (*Antirrhinum majus*) and its cupuliformic mutant - Factor mutation of snapdragon. Shape and colour of flowers. Multiple alleles - Progressive reduction of wings in the fruit fly *Drosophila*. Multiple alleles - Fur colour of guinea-pig (black, brown, white). Multiple alleles - Diagram showing various types of gene mutations - Chromosome mutation in a female fruit fly *Drosophila*. Normal and mutated set of chromosomes - Relation between mutated chromosomes and eye size of fruit flies - Types of chromosome mutations - Inversion of chromosome segment in *Drosophila*. Inversion loop during chromosome pairing - Chromosome mutations in two varieties of peas. Karyograms and chromosome pairing during meiosis - Chromosome sets of epidermal cells and pigment pattern of the heads of haploid, diploid, and triploid salamander larvae - Haploid, diploid, triploid, and tetraploid plants of *Solanum* (nightshade) - Genome mutations in *Drosophila* - Leaf shape of stock (*Matthiola*) due to various surplus chromosomes - Normal shoot growing from the variegated leaf of *Sansevieria nobilis*. Proof of development of a chimera and of somatic mutation - Mutagenic effect of nitrous acid on DNA. Change of nucleic acid bases - Selection of deficiency mutants in bacteria - Metabolic block and accumulation of products. Tracing of metabolic chains.

Cat #: JL-2ST

Mitosis and Meiosis in Animals and Plants Overheads



25 Overheads

Atlas of 24 OHP Transparencies size 22 x 28 cm, comprising over 95 colour pictures. Specially selected and beautiful multicoloured photomicrographs are presented on this atlas. In strong plastic file with ring-mechanism.

Typical Cell Division in the Root Tip of the Hyacinth - An unique series to illustrate the normal sequence of mitosis. The photomicrographs show each stage in a high degree of magnification. The cell components are differentiated in contrasting colours by a special staining technique. - Interphase, the resting nucleus shows the chromatin in the form of a fine network, nuclear membrane and nucleoli are present - Early prophase, the chromosomes appear as fine threads - Late prophase, the chromosome threads shorten by contraction - Early metaphase,

duplicate daughter chromosomes are formed - Metaphase, in this stage the chromosomes are arranged on the equatorial plate in the centre of the cell - Early anaphase, the chromatids separate and the daughter chromosomes move away from the equator - Late anaphase, the daughter chromosomes reach the opposite cell poles - Early telophase, chromosomes become reorganized to form the daughter nuclei, formation of the primary cell wall - Late telophase, the new cell wall is formed and the nucleoli are reformed - Reconstruction of interphase nuclei. Complete separation of the daughter cells by the new cell wall.

Development of the Microspore Mother Cells of *Lilium* (Anthers) - New combination of hereditary traits and reduction of the number of chromosomes are the aim of meiotic division. *Lilium* is highly suitable for demonstration purposes because of the unusually large size and clearness of its chromosome structures - Young anther of lily. t.s. low magnification for general study - Microspore mother cells, resting stage - Leptotene, the chromosomes appear as

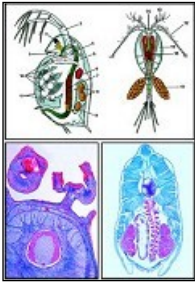
fine threads - Zygotene, the homologous chromosomes associate in pairs - Pachytene, complete pairing of the chromosomes - Diplotene, bivalent chromosomes split, chiasmata, interchange of genetic material - Diakinesis, contraction of the bivalents, nuclear membrane disappears - Metaphase of the first (heterotypic) division showing the formation of the equatorial plate, surface view - Equatorial plate, surface view showing the duplicated chromosomes - Metaphase, side view, a spindle is formed in this stage - Anaphase, side view. Movement of the daughter chromosomes towards the cell poles, two haploid sets of chromosomes are separated - Telophase, the new cell wall is formed between the two daughter cells - Prophase of the second (homeotypic) division - Metaphase of the second division, two mitotic figures are present - Pollen tetrads. Four nuclei are formed after the second division, each bearing the haploid number of chromosomes. Formation of cell walls - Uninuclear microspores after the separation of the daughter cells - Prophase of the third division - Metaphase of the third division - Anaphase of the third division, spindle fibres are visible - Telophase of the third division. The generative nucleus remains on the cell wall - Mature two-nucleate pollen grain at the time of shedding. Each pollen grain possesses a tube cell and a generative cell - Mature pollen grain. w.m. to show the structure of the cell wall - Growing pollen grain showing pollen tube - Growing pollen tube, l.s. showing the division of the generative cell into two sperm nuclei.

Development of the Megaspore Mother Cells of *Lilium* (Embryosac) - Meiotic and mitotic divisions also take place in the development of the female gametophyte. A number of nuclei are involved and in order to produce this series, thousands of sections had to be prepared - Ovary of lily, t.s. low magnification for general study - Very young ovary before the formation of the megaspore mother cell or embryosac mother cell. Abundant mitotic figures in the tissue - Developing embryosac mother cell - Megaspore mother cell, pachytene stage of prophase. Paired homologous chromosomes, beads of chromatin visible - Anaphase of the first (heterotypic) division. Spindle fibres visible - Telophase of the first division. Each daughter nucleus contains the haploid number of chromosomes - Two-nucleate embryosac, prophase of the following second division - Anaphase of the second (homeotypic) division. Median l.s. of the embryosac showing two division figures and spindles - Telophase of the second division showing remaining spindle fibres - Primary or first four-nucleate stage - Primary four-nucleate stage, three nuclei migrate to the chalazal end of the embryosac, one nucleus remains in the micropylar end - Prophase of the third division - Metaphase of third division, after the three chalazal nuclei have fused - Telophase of the third division - Second four-nucleate stage, consisting of two haploid and two triploid nuclei. A vacuole can be observed - Metaphase of the fourth division - Anaphase of the fourth division - Eight-nucleate stage, the mature embryosac. Egg nucleus, synergid nuclei, polar nuclei, and antipodal nuclei - Double fertilization by the two sperm nuclei of the pollen tube. One sperm nucleus fuse with the egg nucleus, the other fuse with the two polar nuclei of the embryosac - Formation of the embryo, early stage. Many mitotic figures in the endosperm cells - Formation of the embryo, later stage. Low magnification showing the complete integument with young embryo and endosperm - Young embryo with suspensor cells, l.s. for high magnification detail - Older embryo, l.s. showing formation of cotyledon.

Maturation and Cleavage of *Ascaris megalocephala bivalens* - Due to its low number of chromosomes (only four), *Ascaris megalocephala bivalens* is an ideal zoological example to demonstrate the complex phenomena of reduction divisions, fertilization and early cleavage in animals - Primary germ cells in the growing zone of oviduct - Entrance of spermatozoon in the oocyte - Oocyte before the beginning of reduction divisions. The genetic substance appears in form of two tetrads, each with four chromosomes - First maturation division in the oocyte. Eight chromosomes and the spindle are visible. The male pronucleus in the middle of the oocyte - Formation of the first polar body - Second maturation division of the oocyte. Four chromosomes visible - Formation of the second polar body. Only two chromosomes remain in the oocyte, subsequently they change to the female pronucleus - Mature oocyte with male and female pronuclei, each nucleus contains two chromosomes. Both the extruded polar bodies can be seen - The nuclear membranes of the pronuclei disappear, and the maternal and paternal chromosomes become visible (fertilization) - Metaphase of the first cleavage, the frontal view of equatorial plate shows four large chromosomes. The somatic number of chromosomes is now restored - Metaphase, equatorial plate in side view shows chromosomes, spindle fibres, centrioles - Anaphase, beginning movement of the daughter chromosomes towards the poles of the spindle - Early telophase, beginning constriction of the cell body - Telophase, further division of the cell body - Late telophase, complete division of the cell body between the daughter cells - Second cleavage with two division figures - Later stage of foetal development showing young embryo.

Development of the Female Gametophyte of *Pinus* - With many species of pine, the ovules mature within two vegetation periods. In the first year, the pollination and the growth of the female gametophytes takes place. The formation of archegonia and the fertilization does not take place until the following spring. - Young female cone, median l.s. for general view, low magnification - Bract scale, ovuliferous scale and ovule, median l.s. for medium magnification detail - Young ovule before pollination, median l.s. showing the megaspore mother cell - Growing ovule at free nuclear stage, after repeated division of the megaspore mother cell without formation of cell walls - Growing ovule, later stage with young macroprothallium. A pollen grain is visible on the micropyle - Mature archegonium, median l.s. showing neck canal cells, ventral canal cell, egg nucleus, layer of jacket cells, paranuclei - Fertilization of the archegonium by entrance of the pollen tube - First division of fertilized egg nucleus (zygote nucleus), anaphase - Four-nucleate stage, all nuclei in the centre of the archegonium - Four-nucleate stage, the nuclei migrate towards the base of the archegonium - Sixteen-nucleate stage, the nuclei lie in four tiers of four. Rosette cells, suspensor cells, embryonic cells - Young proembryo with short suspensor cells - Older proembryo with elongated suspensor cells and four young embryos - Mature embryo with endosperm, median l.s. showing cotyledons, radicle, hypocotyl, plumule - Mature embryo with endosperm, t.s. showing the eight cotyledons.

Cat #: JL-22ST

Anatomy of Invertebrates Overheads**26 Overheads**

Atlas of 26 Overhead-Transparencies size 22 x 28 cm, comprising over 110 pictures (colour photomicrographs and - macrographs, colour life-cycles and anatomical pictures). With comprehensive interpretation text. In strong plastic file with ring-mechanism. - By Dr. K.-H. Meyer and Johannes Lieder.

Protozoa: Amoeba proteus, w.m. - Amoeba proteus, colour design showing habit, cyst, feeding, division, - Euglena, a common green flagellate w.m. - Euglena, habit, division, conjugation and formation of cysts. Colour design - Radiolaria, mixed species - Foraminifera, mixed species - Trypanosoma gambiense, habit and division, colour design - Trypanosoma gambiense, causing sleeping disease, blood smear - Ceratium, dinoflagellates w.m. - Noctiluca miliaris Plasmodium falciparum, malignant tertian malaria, blood smear Plasmodium berghei, blood parasite in rodents, smear with asexual and sexual stages - Eimeria stiedae, causing coccidiosis in rabbit, section of liver - Paramecium, common ciliate, anatomy, colour design - Paramecium, photomicrograph of living specimen - Paramecium, macro- and micronuclei stained - Paramecium in binary fission. Simple form of reproduction - Paramecium in conjugation - Paramecium, stained for structure of the surface - Vorticella, a stalked ciliate, photomicrograph of living specimen.

Porifera Sponge of the sycon type, schematic colour design - Sycon, marine sponge of the sycon type, t.s. - Spongilla, fresh water sponge, t.s. - Sycon, calcareous spicules w.m. - Euspongia, commercial sponge, skeleton.

Coelenterata: Hydra, fresh water polyp, anatomy and reproduction, colour design - Hydra with bud, w.m. - Hydra, transverse section, different kinds of nematocysts, graphic colour design - Hydra, t.s. of the body in different levels - Hydra, l.s. of a specimen with food in the gastrovascular cavity - Polyp and medusa (Obelia), life cycle and development, colour design - Obelia hydroid, colony of vegetative and reproductive polyps, colour design - Obelia medusa, jellyfish, w.m. - Aurelia, ephyra w.m. - Actinia (Metridium), sea anemone, t.s. young specimen - Actinia, l.s. young specimen.

Platyhelminthes: Fasciola hepatica (beef liver fluke), digestive, reproductive, excretory, nervous systems, colour designs - Fasciola hepatica (Distomum hepaticum), beef liver fluke, flat mount - Fasciola hepatica, t.s. body - Planaria, w.m. of entire specimen. General body plan of a flatworm - Planaria, t.s. - Taenia saginata, tapeworm, t.s. of proglottids in different stages - Taenia saginata, mature proglottid with all organs, graphic colour design - Taenia saginata, mature proglottid to show the branched uterus filled with eggs w.m. - Moniezia, tapeworm, scolex with immature proglottids w.m. - Echinococcus granulosus, dog tapeworm, adult specimen with scolex and proglottids - Echinococcus granulosus, t.s. of cyst wall with scolices.

Nemathelminthes: Ascaris, roundworm, transverse section, schematic colour design - Ascaris, t.s. of adult female in region of gonads - Nemathelminthes, Ascaris, general body plan of male and female, colour design - Trichinella spiralis, section of infected muscle with encysted larvae - Trichinella spiralis, infected muscle piece flattened and w.m. - Enterobius vermicularis (Oxyuris), pin worm, w.m. - Nereis, t.s. of body for general study - Hirudo medicinalis, medicinal leech, t.s. - Lumbricus, earthworm, copulating specimens, reproduction, and transverse section, schematic colour design - Lumbricus, earthworm, t.s. of body back of the clitellum for general study - Lumbricus, anterior end 1.-9. segment l.s. - Lumbricus, anterior end 9.- 16. segment l.s. - Lumbricus, anterior end 16.-23. segment l.s.

Crustacea Daphnia and Cyclops, small crustaceans, anatomy, colour design - Daphnia, water flea, living specimen - Cyclops, copepods - Artemia salina, brine shrimp, developing stages - Astacus, crayfish, gills t.s. - Astacus, ovary t.s. with developing eggs - Astacus, testis t.s. with spermatogenesis

Arachnida: Spider, anatomy and general body plan, graphic colour design - Spider, sagittal l.s. of abdomen - Spider, t.s. of book or trachea lung, detail - Spider, entire young specimen - Spider, leg with comb - Spider, leg w.m. high magnification to show the comb - Spider, spinneret - Scorpion, entire young specimen w.m. for all details - Scorpion, sagittal l.s. through young specimen - Scorpion, sec. through the poison gland - Varroa, parasitic mite of bees - Argas persicus, tick, w.m. of adult - Ixodes, tick, w.m. of six legged larva - Dermanyssus gallinae, chicken mite - Tyroglyphus farinae, mite from meal.

Insecta: Musca domestica, house fly, head and mouth parts w.m. - Musca domestica, mouth parts, w.m. and t.s., colour design - Apis mellifica, honey bee, mouth parts w.m. - Apis mellifica, honey bee, mouth parts w.m. and t.s., colour design - House fly, sucking tube, scanning electron micrograph - Blatta, cockroach, anatomy and general body plan of insects, colour design - Periplaneta or Blatta, cockroach, biting mouth parts of a herbivore w.m. - Periplaneta, head and mouth parts, colour design - Blatta, cockroach, adult female, dorsal view, reproductive organs, colour design - Pieris, butterfly, clubbed antenna - Bombyx mori, silk moth, feathered antenna - Melolontha, cockchafer, laminate antenna - Pieris, butterfly, mouth parts with sucking tube - Musca domestica, structure of the leg, colour design - Musca domestica, leg with pulvilli - Apis mellifica, honey bee, structure of the leg, colour design - Apis

mellifica, posterior leg with pollen basket - *Apis mellifica*, foreleg with antenna cleaner and pollen brush - *Melolontha*, cockchafer, digging leg - *Apis mellifica*, anterior and posterior wings - *Musca domestica*, wing with halteres - Spiracle (stigma) of insect, surface view and section, colour design - Spiracle (stigma) of insect, w.m. - Wing of butterfly, arrangement of scales, colour design - *Pieris*, butterfly, wing showing arrangement of scales - Trachea from insect, colour design - Trachea from insect, showing elastic spiral threads - *Periplaneta*, cockroach, upper and lower wings - Tracheal gills, of May fly nymph, colour design - Compound eye of an insect, histology, schematic colour design - Head with brain and eyes of an insect t.s., colour design - Compound eye, t.s. through head of honey bee, showing insect eyes - Cornea, isolated from eye showing facets - Compound eye of *Melolontha*, showing superposed insect eye, l.s. - Grasshopper, testis t.s. with spermatogenesis - Sting of honey bee, anatomy and function, colour design - Sting and poison sac of honey bee, w.m. - *Apis mellifica*, honey bee, t.s. of abdomen of drone showing testis - *Apis mellifica*, t.s. of abdomen of queen showing ovaries - *Anopheles*, malaria mosquito, adult female - *Anopheles*, head and mouth parts of female - *Anopheles*, head and mouth parts of male - *Culex pipiens*, common mosquito, adult female - *Culex pipiens*, head and mouth parts of female - *Culex pipiens*, head and mouth parts of male - *Drosophila*, fruit fly, adult - Flea, anatomy and structure, colour design - *Ctenocephalus canis*, dog flea, adult male - *Pulex irritans*, human flea, adult female - *Pulex irritans*, human flea, adult male - *Pediculus humanus*, human louse - *Cimex lectularius*, bed bug - *Aphidae* sp., plant lice.

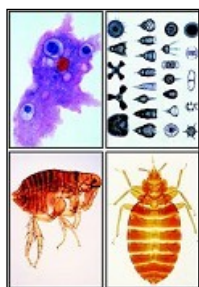
Mollusca: *Chiton*, a primitive mollusc, t.s. through the body - *Alloteuthis*, cuttlefish, entire young specimen - Octopus, cuttlefish, section through sucking tube - Cuttlefish, anatomy and general body plan, colour graphic design - Camera eye of cuttlefish (*Sepia*), l.s. - *Mya arenaria*, t.s. and l.s. of gills showing ciliated epithelium - Anodonta, mussel, small specimen, complete t.s. - Mussel (clam), anatomy and general body plan, colour graphic design - Snail, anatomy and general body plan, colour graphic design - Snail, typical t.s. of small specimen for general study - *Helix pomatia*, Roman snail, hermaphrodite gland (ovotestis) t.s.

Echinodermata: *Echinus*, sea urchin, reproduction, colour graphic design - *Asterias*, horizontal l.s. with internal organs, colour graphic design - *Asterias*, sagittal l.s. with internal organs, colour graphic design - *Asterias*, arm t.s. for general study - *Asterias*, schematic transverse section through the arm (ray), colour design - Sea urchin embryology, uncleaved fertilized egg - Sea urchin, 2-cell stage - Sea urchin, 4-cell stage - Sea urchin, 8-cell stage - Sea urchin, morula - Sea urchin, blastula - Sea urchin, gastrula - Sea urchin, pluteus larva.

Acrania, Fish, Amphibians, Reptiles and Birds: *Branchiostoma lanceolatum*, block diagram combined with t.s. and l.s., colour design - *Branchiostoma lanceolatum*, typical t.s. for general study, shows gills, liver and gonads - Scyllium, dogfish, region of head and gills, t.s. - Fresh water fish, abdominal region t.s. - *Cyprinus*, carp, blood smear - Fish scales, cycloid scales - Fish scales, ctenoid scales - Fish scales, placoid scales - Salamandra larva, head with eyes t.s. - Rana, frog, blood smear - Rana, stomach t.s.. mucous membrane with gastric glands - Rana, small intestine (duodenum) t.s., with folds of mucous membrane, chyle, and columnar epithelium - Rana, lung t.s., simple baglike lung - Rana, kidney t.s., Malpighian corpuscles, renal vessels - Rana, testis showing spermatogenesis t.s. - Rana, ovary with developing eggs t.s. - Rana, skin with skin glands, vertical l.s. - Lacerta, lizard, skin with scales, l.s. - Lacerta, lizard, lung t.s. - Gallus, chicken, blood smear - Gallus, lung t.s. showing bird lung with parabronchi - Bird feather, construction and function, colour design - Bird feather, wing - Bird feather, down.

Cat #: JL-14ST

Atlas of the Multimedia Program for Biology Overheads



45 Overheads

Atlas of 43 OHP Transparencies size 22 x 28 cm, comprising over 220 colour photomicrographs according to the 175 Prepared Microscope Slides of the **MULTIMEDIA-SYSTEM FOR BIOLOGY A, B, C and D** (see pages 4 - 10) This atlas of OHP transparencies is intended to present a clear-cut outline of all fields of biology and cover all the organisms studied in schools. Each of the specimens has been carefully chosen on the basis of its instructional value.

ZOOLOGY - *Amoeba proteus*, showing nucleus and pseudopodia - *Radiolaria*, mixed species - *Foraminifera*, mixed species - *Euglena*, flagellate with eyespot - *Trypanosoma gambiense*, sleeping disease, blood smear - *Plasmodium berghei*, malaria parasite, blood smear -

Paramecium, nuclei stained - *Sycon*, marine sponge t.s. - *Hydra*, w.m. extended specimen - *Hydra*, t.s. of body - *Obelia hydroid*, w.m. of colony - *Planaria*, typical t.s. - *Dicrocoelium lanceolatum*, sheep liver fluke w.m. - *Distomum hepaticum (Fasciola)*, beef liver fluke w.m. - *Taenia saginata*, tapeworm, proglottids t.s. - *Taenia*, tapeworm, w.m. of mature proglottids - *Trichinella spiralis*, l.s. of skeletal muscle showing encysted larvae - *Ascaris*, roundworm, t.s. of female in region of gonads - *Lumbricus*, earthworm, typical t.s. back of clitellum - *Daphnia* and *Cyclops*, small crustaceans - *Araneus*, spider, leg with comb w.m. - *Araneus*, spinneret w.m. - *Dermanyssus gallinae*, chicken mite, w.m. - *Musca domestica*, house fly, head and mouth parts - *Musca domestica*, leg with clinging pads - *Apis mellifica*, honey bee, mouth parts of worker - *Apis mellifica*, honey bee, wings - *Apis mellifica*, hind leg of worker with pollen basket - *Apis mellifica*, sting and poison sac - *Apis mellifica*, head with compound eyes and brain t.s. - *Apis mellifica*, abdomen of worker t.s. with intestine and nephridia - *Periplaneta*, cockroach, chewing mouth parts - *Culex pipiens*, mosquito, head and piercing-sucking

mouth parts of female - **Culex pipiens**, mosquito, reduced mouth parts of male - **Trachea** from insect - **Spiracle** from insect - **Pieris**, butterfly, portion of wing with scales - **Ctenocephalus canis**, dog flea, w.m. - **Cimex lectularius**, bed bug, w.m. - **Helix pomatia**, snail, hermaphrodite gland (ovotestis), t.s. with developing ova and spermatozoa - **Mya arenaria**, clam, gill sec. with ciliated epithelium - **Bird feathers**, wing or vane and down feathers - **Asterias rubens**, starfish, arm (ray) t.s. showing tube feet, digestive gland, ampullae - **Branchiostoma lanceolatum** (Amphioxus), typical t.s. of body with gills, liver, and gonads.

HISTOLOGY OF MAN AND MAMMALS - **Squamous epithelium**, isolated cells from human mouth - **Ciliated epithelium**, in t.s. of fallopian tube - **Fibrous connective tissue** of mammal - **Tendon** of cow, l.s. white fibrous tissue - **Adipose tissue**, stained for fat - **Hyaline cartilage** t.s. - **Compact bone**, t.s. cells, lamellae, and canaliculi - **Striated muscle**, l.s. showing nuclei and striations - **Heart muscle**, human, l.s. branched fibres with intercalated discs - **Smooth (involuntary) muscle** l.s. and t.s. - **Lung** of cat, t.s. showing alveoli - **Human blood smear**, red and white corpuscles - **Frog blood smear**, nucleated red corpuscles - **Artery and vein** of mammal, t.s. - **Lymph gland** of pig, t.s. showing lymphoid tissue - **Thyroid gland** of pig, sec. showing colloid - **Adrenal gland** of cat, t.s. through cortex and medulla - **Oesophagus** of cat, t.s. - **Stomach** of cat, t.s. fundic region - **Small intestine** of cat, t.s. - **Large intestine (colon)**, t.s. stained for mucous cells - **Liver** of pig, t.s. - **Pancreas** of pig, sec. with islets of Langerhans - **Kidney** of cat, t.s. through cortex and medulla - **Ovary** of cat, t.s. with primary, secondary, and Graafian follicles - **Testis** of mouse, t.s. showing spermiogenesis - **Sperm** of bull, smear - **Medullated nerve fibres**, osmic acid fixed showing Ranvier's nodes - **Motor nerve cells**, smear from spinal cord of cow - **Spinal cord** of cat, t.s. white and grey matter - **Cerebrum**, human, t.s. of cortex with pyramidal cells - **Cerebellum** of cat, t.s. shows Purkinje cells - **Retina** of cat, t.s. detail of rods and cones - **Tongue** of rabbit, t.s. of papilla foliata with taste buds - **Human skin** from palm, v.s. sweat glands - **Human scalp**, l.s. of hair follicles.

BOTANY, BACTERIA AND CRYPTOGAMS - **Bacteria from mouth**, smear Gram stained showing bacilli, cocci, spirilli, spirochaetes - **Bacillus subtilis**, hay bacillus, smear with bacilli and spores - **Streptococcus lactis**, milk souring organisms - **Oscillatoria**, a blue green filamentous alga - **Nostoc**, blue green alga, colonies within gelatinous sheaths - **Diatoms**, mixed species - **Cladophora**, green alga, branched filaments with multinucleate cells - **Volvox**, with daughter colonies and sexual stages - **Spirogyra**, vegetative filaments with spiral chloroplasts - **Spirogyra** in scalariform conjugation, formation of zygotes - **Desmids (Desmidiaceae)**, various species - **Fucus vesiculosus**, brown alga, female conceptacle with oogonia t.s. - **Fucus vesiculosus**, male conceptacle with antheridia t.s. - **Mucor or Rhizopus**, mould, w.m. of mycelium and sporangia - **Morchella**, morel, t.s. of fruiting body with asci and spores - **Claviceps purpurea**, ergot, sclerotium t.s. - **Saccharomyces**, yeast, budding cells w.m. - **Psalliota**, mushroom, t.s. of pileus with basidia and spores - **Puccinia graminis**, wheat rust, uredinia on wheat leaf t.s. - **Puccinia graminis**, acidia and pycnidia on barberry leaf t.s. - **Physcia**, lichen, thallus with symbiotic algae t.s. - **Marchantia**, liverwort, antheridia l.s. - **Marchantia**, archegonia l.s. - **Moss** stem with leaves w.m. - **Sphagnum**, peat moss, w.m. of leaf with chlorophyll-bearing and hyaline cells. - **Fern prothallium**, w.m. showing sex organs - **Pteridium**, bracken fern, rhizome t.s. - **Aspidium**, t.s. of leaf with sori, sporangia and spores - **Equisetum**, horse tail, strobilus with spores l.s. Botany, Phanerogams. - **Allium cepa**, onion, w.m. of epidermis shows simple plant cells - **Root tip** and root hairs - **Zea mays**, corn, monocot root t.s. - **Ranunculus**, buttercup, dicot root t.s. - **Tilia**, lime, woody dicot root t.s. - **Dahlia**, t.s. tuber with inuline crystals - **Lupinus**, lupin, root nodules with symbiotic bacteria t.s. - **Elodea**, waterweed, stem apex l.s. meristematic tissue and leaf origin - **Zea mays**, corn, monocot stem with scattered bundles t.s. - **Helianthus**, sunflower, herbaceous dicot stem t.s. - **Pyrus**, pear, t.s. of fruit with stone cells - **Solanum tuberosum**, potato, tuber with starch and cork cells t.s. - **Elodea**, waterweed, aquatic stem with primitive bundle t.s. - **Triticum**, wheat, t.s. of stem of a gramineous plant - **Aristolochia**, birthwort, one year stem t.s. - **Aristolochia**, older stem t.s. - **Sambucus**, elderberry, stem with lenticels t.s. - **Tilia**, lime, three sections of wood - **Cucurbita**, pumpkin, l.s. of stem with sieve tubes and vessels - **Cucurbita**, pumpkin, stem t.s. with sieve plates - **Euphorbia**, spurge, stem with lactiferous ducts l.s. - **Salvia**, sage, t.s. of a square stem with angular collenchyma - **Tulipa**, tulip, epidermis of leaf with stomata and guard cells w.m. - **Iris**, typical monocot leaf t.s. - **Syringa**, lilac, leaf t.s. - **Fagus**, beech, sun and shade leaves, two t.s. - **Nerium**, oleander, xerophytic leaf with sunken stomata, t.s. - **Lilium**, lily, anthers t.s. - **Lilium**, ovary t.s. showing arrangement of ovules - **Taraxacum**, dandelion, composite flower l.s. - **Triticum**, wheat, grain with embryo l.s. - **Pinus**, pine, three sections of wood - **Pinus**, pine, male cone with pollen l.s. - **Pinus**, female cone with ovules l.s. - **Pinus**, mature pollen grains with wings w.m.

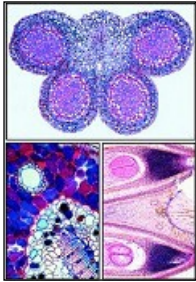
CYTOLOGY AND GENETICS - **Allium cepa**, l.s. of root tips showing mitosis in all stages - **Lilium**, lily, t.s. of young anthers, meiotic stages of the pollen mother cells - **Salamandra larva**, sections with mitotic stages - **Mitochondria**, in thin sec. - **Golgi apparatus**, t.s. through spinal ganglion - **Chloroplasts**, in leaf of Elodea or Mniium, special stained - **Aleurone grains**, in sec. of Ricinus endosperm - **Allium cepa**, onion, w.m. of dry scale showing calcium oxalate crystals - **Storage**, section of liver or kidney, vital stained with trypan-blue to demonstrate storage - **DNA in cell nuclei**, by Feulgen staining technique - **DNA and RNA**, fixed and stained with methyl green and pyronine to show DNA and RNA in different colours - **Giant chromosomes** from the salivary gland of Chironomus. Individual genes and puffs can be observed - **Human chromosomes**, spread in the stage of metaphase, for counting chromosomes - **Meiotic and mitotic stages** in crayfish testis. Nuclear spindles - **Maturation divisions** in ova of Ascaris megalocephala - **Cleavage stages** in ova of Ascaris Embryology. - **Chicken embryo**, 48 hour, t.s. with neural tube and chorda - **Sea-urchin development** (Psammechinus miliaris), two cell, four cell and eight cell stages - **Sea-urchin development** (Psammechinus miliaris), morula, blastula and gastrula - **Frog embryology** (Rana), sec. through the blastula stage showing the blastocoel - **Frog embryology** (Rana), sag. sec. through young larva in the tail bud stage, with primordia of organs.

BACTERIA AND DISEASED ORGANS OF MAN - *Escherichia coli*, bacteria from colon, probably pathogenic, smear Gram stained - *Eberthella typhi*, causing typhoid fever, smear Gram stained - **Tuberculous lung** of man, t.s. with miliary tuberculosis - **Coal dust lung (Anthraxosis)** of man, t.s. (smoker's lung) - **Liver cirrhosis** of man caused by alcohol abuse, t.s. showing degeneration of liver cells - **Arteriosclerosis**, t.s. of diseased coronary artery - **Metastatic carcinoma (cancer)** of human liver, t.s.

ECOLOGY AND ENVIRONMENT - **Leaf (needle) of fir** (*Abies*), two t.s. of leaves, healthy and damaged by environmental influences (acid rain) - **Leaf of beech** (*Fagus*), two t.s. of leaves, healthy and damaged by environmental influences (acid rain) - **Bacteria from waste-water**, smear with many typical forms.

Cat #: JL-19ST

Botany Part 1: Cryptogams Overheads



18 Overheads

Atlas of 18 Overhead Transparencies size 22 x 28 cm, comprising 116 pictures (anatomical pictures, photomicro- and macrographs, nature photographs, electron micrographs, drawings, diagrams, tables, scenes, test data and results). With comprehensive interpretation text. In strong plastic file with ring-mechanism. - By Dr. Dieter Gerlach and Johannes Lieder.

Cell Nucleus and Chromosomes: This series illustrates the various structures of nuclei and chromosomes, pictures of mitosis and polyploidy, living nuclei, shape of nuclei and function, giant chromosomes, polyploidy, fine structure of nuclei, chromosome structure, mitosis, individuality of chromosomes. - Typical animal cell, showing all details visible by light and electron microscope -

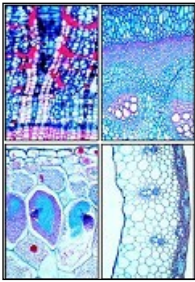
Typical plant cell, showing all details visible by light and electron microscope - Nuclei of the alga *Spirogyra* and of an amoeba, live - Onion epidermis: position of nucleus in plant cell, live (phase contrast) - Onion epidermis: fixed and stained nucleus - Nuclear membrane of a plant cell, tetrazyclin-fluorescence - Simple animal cells in sec. of salamander liver showing nuclei, protoplasm, and cell walls - Nuclear equivalents in bacteria, acridinorange-fluorescence - Chromato- and centropoplasm in blue-green algae (*Oscillatoria*), fluorescence - Metabolically active nucleus (interphase nucleus) of *Vicia faba*. Chromocentres, chromonemata, centromeres - Lampbrush chromosomes of diplotene stage in living egg cell of salamander (phase contrast) - Polytene giant chromosomes: nucleus from salivary gland of *Chironomus* larva, live - Sex chromosomes: spermatozoa without and with X-chromosomes from testis of a locust - Arrangement and shape of nuclei due to tissue functions: nuclei of connective tissue, chains of nuclei in skeletal muscles - Nuclear volume and size due to activity: epithelium of active and inactive thyroid gland - Nuclear shape in cancer cells not due to function - Polynucleate cells: giant cells of Langerhans and macrophages - Giant cell of a sarcoma - Syncytium, an undivided mass of protoplasm containing many nuclei - Position of nuclei in animal cells, classes of nuclear size - Polyploid nuclei: intestinal epithelium of an insect - Chromosomes during mitosis, squash preparation of *Allium* root tip DNA stained by Feulgen - Polyploid nuclei: polyploid chromosome sets of cultivated plants - Enlargement of nuclear surface: nucleus of a suctorian and giant nuclei in endocrine organs - Pigment cells in the skin - Motor nerve cell shows nucleus, nucleolus, Nissl's granules, and nerve processes - Glandular epithelium, t.s. showing goblet cells - Fine structure of the nucleus: nuclear membrane, nuclear content, nucleoli, electron micrograph - Ditto: nuclear membrane and RNA exit, electron micrograph - Ditto: fibrillar structure of chromosomes, electron micrograph - Rearrangement of nuclei in spermatozoa, electron micrograph - Mitochondria in thin sec. of amphibian liver - Mitochondria in plant cells, high magnification detail - Mitochondria, diagram - Golgi apparatus in epithelial cells - Golgi apparatus in secretory cells, electron micrograph: endoplasmic reticulum and dictyosomes - Golgi apparatus, diagram - Chloroplasts with grana from cells of *Tradescantia*, bright field - Ditto. fluorescence - Chloroplasts, electron micrograph, mesophyll cell: cell walls, vacuole, chloroplasts, grana of plastids - Ditto: chloroplast showing starch, grana and thylakoids - Ditto: chloroplast; highly magnified cut-out with details in grana, thylakoids, ribosomes - Chloroplasts, diagram - Amitosis (direct division), division of nucleus and cell body without appearance of chromosomes, t.s. of liver - Amitotic division of the nucleus of *Amoeba proteus* - *Paramecium* in binary fission. Simple form of reproduction - *Paramecium* in conjugation. A temporary union of two individuals during which nuclear material is exchanged - *Paramecium*, common ciliate, anatomy, diagram - *Amoeba proteus*, habit, cyst, feeding, division, diagram - Cell division (mitosis) in animals, nine subsequent stages, diagram - Cell division (mitosis) in root tips of onion, eight subsequent stages, diagram - Mitosis: root tip of *Allium cepa*; all stages in one picture - Mitosis: root tip of *Hyacinth*; metabolically active nucleus and early prophase - Mitosis: root tip of *Hyacinth*; prophase and early metaphase - Mitosis: root tip of *Hyacinth*; equatorial plate and early anaphase - Mitosis: root tip of *Hyacinth*; telophase and reconstruction - Mitosis: chromatid bridges with fragment during anaphase - Centrioles, centrospheres, spindle fibres: meiosis of an egg cell - Mitosis: fine structure of spindle apparatus and chromosomes, electron micrograph - Comparison of haploid and diploid chromosome sets of various plants and animals, diagram - Human chromosomes during metaphase (equatorial plate) - Normal karyotype with GAG banding pattern - Individuality of chromosomes I. Male and female pronucleus of *Ascaris*, chromosomes of pronuclei - Individuality of chromosomes II. First cleavage spindle, first cleavage. - Follicles in mammalian ovary: Young primary follicles with flat epithelial cells t.s. - Ditto: Older primary follicle with higher epithelial cells t.s. - Ditto: Secondary follicle with stratified epithelium t.s. - Ditto: Young Graafian follicle, showing formation of a vacuole l.s. - Ditto: Older Graafian follicle, showing large vacuole, discus proligerus and oocyte l.s. - Ditto: Mature oocyte with membrana pellucida and corona radiata t.s. - Sea-urchin development: Uncleaved egg, before fertilization. Large nucleus - Ditto: Uncleaved egg, after fertilization. A fertilization membrane becomes visible - Ditto: Two-cell

stage. Formation of two equal blastomeres after the first cleavage - Ditto: Four-cell stage, polar view.

Chromosomes and Genes: Nuclei and chromosomes are conspicuous structures of cells. The part they play in cellular activities, their function and importance in heredity and cell division, as well as their molecular-biological aspects are treated in part II and III of this atlas. - Structure of chromosome: diagram of a chromosome seen under the light microscope - Giant chromosomes of *Chironomus*, diagram - Structure and activity of chromosomes: loop complex of a chromosomal puff in polytene chromosome of *Chironomus*. - Chromosomes: giant chromosomes of *Chironomus*, DNA-RNA-staining with orceine and light green - Inheritance of two linked genes in *Drosophila*: cross, backcross, linkage groups - Gene exchange between two corresponding linkage groups of *Drosophila*, chromosomal interpretation - Oogenesis, spermatogenesis, fertilization and cleavage in animals, diagram - Gene locations (loci). Map of loci on chromosomes of *Drosophila* - Meiosis: t.s. of mammalian testis. Spermatogonia, meiosis of spermatocytes I and II, spermatids, spermatozoa - Meiosis: squash preparation of mammalian testis, orceine stain - Maturation divisions in mammals, diagram - Maturation divisions in plants (*Lilium*), 18 subsequent stages, diagrams - Meiosis and mitosis in microspore cells of *Lilium*: microspore mother cells, resting stage - Ditto: leptotene stage, chromosome threads with chromomeres - Ditto: zygotene stage, pairing of homologous chromosomes. - Ditto: pachytene stage. Termination of pairing: homologous partners are in close contact forming bivalents - Ditto: diplotene stage. Concentration and spiralization of pairs, chiasmata - Ditto: diakinesis stage. Maximal shortening of chromosomes, nucleolus dissolves - Ditto: metaphase of the first (heterotypic) division, formation of the equatorial plate - Ditto: equatorial plate, surface view showing the duplicated chromosomes - Ditto: metaphase stage, ring- and cross-shape of chromosomes, equatorial plate in lateral view - Ditto: anaphase stage. Separation of chromosomes, polar movement of dyads - Ditto: telophase, the new cell wall is formed between the two daughter cells - Ditto: metaphase of the second (homeotypic) division, two mitotic figures are present - Ditto: pollen tetrads. Four nuclei are formed after the second division, each bearing the haploid number of chromosomes. Formation of cell walls - Ditto: uninuclear microspores after the separation of the daughter cells - Ditto: telophase of the third division. The generative nucleus remains on the cell wall - Ditto: mature two nucleate pollen grain at the time of shedding. Each pollen grain possesses a tube cell and a generative cell - Causal relations between crossing-over and chiasmata; separation of chromatid tetrads - The crossing-over: breakages, healing - Fine structure of genes: crosses of mutants of the coli phage T4 - Localization of genes in chromosomes: chromosome aberrations - Chromosome mutations: ring-chromosomes, deletions, duplications, deletion of terminal segments, inversions, translocations - Extra chromosomes: karyotype of a human with Down's syndrome (trisomy 21, mongolism) - Sex chromatin: Barr bodies (sex chromatin) in human female epithelial and nerve cells, 2 pictures - Replication: macronucleus before division in the ciliate *Euplotes* - Replication of chromosomes: introduction of radioactively labelled thymidine - Replication of chromosomes: distribution of radioactively labelled thymidine by mitoses - Equatorial plate showing four large chromosomes. Metaphase of first cleavage (mitosis) of *Ascaris* - Germ plasm, somatic cells: chromosome diminution in *Ascaris*.

Gene and Molecule: This series was conceived to not only present the results of research, but also to show the experimental basis, and to allow the students to take part in the intellectual process of development of science. - Topics: Providing the material structure of the gene. Structural characteristics of DNA. Identical replication as a cause of hereditary constancy. DNA, RNA and protein synthesis as causes of character formation. Genetic code and molecular mechanisms in mutations. - Specialized didactic guiding ideas: Relations between structure and function on a molecular level. Explanation of genetic observations by means of characteristics and reactions of molecules. Problematisation of the results by illustration of the hypotheses, methods and experiments, which lead to the results. I. DNA, the hereditary substance - Transformation in *Streptococcus pneumoniae* - DNA-content of various cells - Hereditary substances of bacteriophages (phages) - Electron micrograph of T2 phages - Reproduction of the phage T2 - Transmission of DNA into human cells - II. Structure of DNA - Nucleotides and their components - Relative components of bases in various DNA - Hydrogen bonding between bases - Structure of the double helix - Electron micrograph of phage-DNA - Electron micrograph of sections through bacterial cells (*E. coli*) - III. Replication of DNA - Models of replication - Prediction of density of replicated DNA - Density gradient centrifugation - Replicating DNA molecule I. - Replicating DNA molecule II. - IV. DNA and RNA - Differences between DNA and RNA - Fractionation of cell components by centrifugation - Synthesizing ability of components - Function of ribosomes - Structure of ribosomes - Amino acid-tRNA-complexes - Specificity of tRNA - Kinds of RNA in the cell - Experiments with artificial messengers - Polysomes on bacterial DNA - Electron micrograph of RNA-phages - Coat protein-gene of an RNA-phage - Summary: replication, transcription, translation - V. Genetic code and mutation - Colinearity between nucleotide- and amino-acid sequence - Frame shift mutations - Triplet-binding test - The genetic code - Relations between codon and anticodon - Begin of protein synthesis - Section of phage RNA - Chemical mutagenesis - Effect of mutations - VI. Synthesis, structure, and function of proteins - Protein-synthesizing complex I - Protein-synthesizing complex II - Secondary structure of proteins: a helix - Secondary structure of proteins: β -pleated sheath - Tertiary structure of a protein: β -chain of haemoglobin - Sickle cell anaemia, erythrocytes - Molecular interpretation.

Cat #: JL-20ST

Botany Part 2: Phanerogams Overheads**20 Overheads**

Atlas of 20 Overhead-Transparencies size 22 x 28 cm, comprising over 142 pictures (anatomical pictures, photomicro- and macrographs, nature photographs, electron micrographs, drawings, diagrams, tables, scenes, test data and results). With comprehensive interpretation text. In strong plastic file with ring-mechanism. - By Dr. Dieter Gerlach and Johannes Lieder.

Cells and Tissues: - Epidermal cells of *Allium cepa* (onion) shows typical plant cells - Epidermal cells of *Allium cepa*, colour graphic design - Mitosis: l.s. of root tip of *Allium cepa* (onion), all stages in one picture - Cell division (mitosis) of *Allium cepa*, onion, 8 stages, colour schematic design - Meiosis, t.s. of *Lilium* (lily) anthers showing pollen development - Meiosis: *Lilium*,

zygotene stage, pairing of homologous chromosomes - Meiosis: *Lilium*, diplotene stage. Concentration and spiralization of pairs, chiasmata - Meiosis: *Lilium*, metaphase of first meiotic division, arrangement of chromosomes in the equatorial plate, top view - Meiosis: *Lilium*, anaphase of first meiotic division. Separation of chromosomes side view - Chloroplasts, w.m. of leaf of *Elodea* with large chloroplasts, bright field - Chloroplast in a mesophyll cell, electron photograph, low magnification - Chloroplast in a mesophyll cell, electron photograph, medium magnification - Chloroplast in a mesophyll cell, detailed electron photograph of the grana, high magnification - Chloroplasts, colour schematic design - Aleurone grains, sec. of *Ricinus* endosperm - Starch grains, sec. of tuber of potato (*Solanum tuberosum*) - Starch grains isolated, high magnification detail, polarized light - Fat, t.s. of endosperm of *Corylus* (hazel) stained for fat - Inulin crystals, t.s. of tuber of *Dahlia* - Calcium oxalate crystals in w.m. of dry *Allium* scale - Raphides, t.s. of *Impatiens* leaf - Stem apex and meristematic tissue of *Asparagus* l.s. - Tracheids, reticulate, annular, and spiral vessels, isolated and w.m. - Cork cells, t.s. bark of *Quercus suber* (oak) - Stone cells, t.s. fruit of *Pyrus communis* (pear) - Parenchyme cells, t.s. of marrow of *Sambucus niger* (elderberry) - Root tip and root hairs, epidermal origin of root hairs - *Pinus*, pine, older woody root t.s.

Roots: - *Zea mays*, corn, root t.s., typical monocot polyarch root - *Zea mays*, corn, root t.s., colour graphic design - *Convallaria*, lily of the valley, t.s. of root shows endodermis, pericycle, phloem, xylem - *Dendrobium*, orchid, aerial root with velamen t.s. - *Smilax*, carrion flower, t.s. of root shows thickened endodermis - *Salix*, willow, l.s. of root showing origin of lateral roots - *Ranunculus*, buttercup, t.s. of a typical dicot root for general study - *Ranunculus*, t.s. of a typical dicot root, colour graphic design - *Ranunculus*, t.s. shows detail view of the vascular tissue with protoxylem - *Medicago*, alfalfa, root t.s. with secondary growth - *Taraxacum*, dandelion, taproot with lactiferous vessels t.s. - *Lupinus*, root nodules with nitrogen fixing bacteria (*Rhizobium*) t.s. - *Alnus*, alder, root nodules with symbiotic actinomycetes (*Streptomyces*) t.s. - *Fagus*, beech, root with ectotrophic mycorrhiza, t.s. - *Neottia nidus avis*, orchid, root with endotrophic mycorrhiza, l.s. - *Cuscuta*, dodder, t.s. stem of host showing the haustoria of the parasite - *Cuscuta*, entrance of haustoria into the host tissue, high magnification.

Stems: - *Pinus*, older stem with annual rings, resin ducts t.s. - *Zea mays*, typical monocot stem with scattered bundles, t.s. - *Zea mays*, typical monocot stem, colour graphic design - *Zea mays*, t.s. of a vascular bundle high magnification detail - *Triticum*, wheat, t.s. stem of a gramineous plant with pith cavity and the ring-shaped arrangement of vascular bundles - *Saccharum*, sugarcane, stem t.s. - *Helianthus*, sunflower, typical dicot herbaceous stem t.s. showing open vascular bundles - *Helianthus*, sunflower, dicot herbaceous stem, colour graphic design - *Cucurbita*, pumpkin, l.s. of stem with sieve tubes and vascular bundles - *Cucurbita*, pumpkin, l.s. of stem, colour graphic design - *Cucurbita*, t.s. of stem showing surface of sieve tubes - *Cucurbita pepo*, t.s. of vascular bundle high magnification detail: xylem, phloem, sieve plates - *Nymphaea*, water lily, aquatic stem with idioblasts t.s. - *Coleus*, t.s. of a square stem showing collenchyma - *Aristolochia*, one year stem, t.s. - *Aristolochia*, older stem, t.s. - *Fagus*, beech, three sections of wood: cross, radial and tangential sections - *Sambucus*, elderberry, stem with lenticells t.s. - *Tilia*, lime, one year, stem t.s. - *Tilia*, two year stem t.s. - *Tilia*, three year stem t.s. - *Elodea*, waterweed, t.s. of aquatic stem showing primitive bundle - *Piper nigrum*, pepper, t.s. of dicot stem with scattered bundles - Stem apex and meristematic tissue of *Elodea*, median l.s. showing leaf origin and growing point.

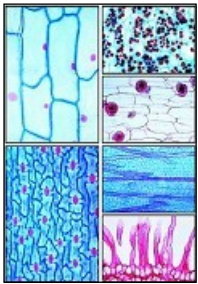
Leaves: - *Pinus*, leaf (needle), t.s. of gymnosperm leaves - *Pinus*, leaf (needle), t.s., colour graphic design - *Elaeagnus*, olive tree, scale-like stellate hairs w.m. - *Verbascum*, mullein, branched leaf hairs w.m. - *Tulipa*, tulip, leaf epidermis with stomata w.m., showing stomata and guard cells - Stomata of leaf epidermis, surface view and section, colour graphic design - *Zea mays*, corn, monocot gramineous leaf t.s. - Typical monocot leaf, t.s., colour graphic design - *Syringa*, lilac, t.s. of a typical mesophytic dicot leaf for general study - Typical dicot leaf, t.s., colour graphic design - *Elodea*, t.s. of leaf showing the simple structure of an aquatic leaf - *Nymphaea*, water lily, floating leaf with air chambers t.s. - *Nymphaea*, water lily, t.s., colour graphic design - *Nerium*, oleander, leaf with sunken stomata, t.s. of a xerophytic leaf - Typical xerophytic leaf, t.s., colour graphic design - *Agave*, xerophytic leaf with thick epidermis t.s. - *Coffea arabica*, coffee, leaf t.s. - *Dionaea*, Venus flytrap, t.s. of leaf with digestive glands - *Drosera*, sundew, leaf with glandular hairs w.m. - *Utricularia*, bladderwort, w.m. of bladder - *Aesculus*, chestnut, t.s. of leaf bud showing bud squama and embedded folded leaves - *Ficus elastica*, India rubber plant, t.s. of leaf with cystoliths - *Buxus*, box, t.s. of xerophytic leaf with thickened cuticle and several palisade layers.

Flowers and Fruits: - *Pinus*, pine, mature pollen grains w.m. - *Pinus*, male cone with pollen t.s. (staminate cone) - *Pinus*, median l.s. of young female cone, megasporophylls with bracts and ovuliferous scales, ovules - *Pinus*, median

I.s. of first year female cone, general view with growing ovules - Pinus, ovule with archegonia, median I.s. - Pinus, embryo and endosperm, median I.s. showing cotyledons - Pinus, embryo and endosperm, t.s. showing cotyledons - Mixed pollen types, showing various forms of many different species - Liliium, anther t.s. showing pollen chambers and pollen grains - Liliium, ovary t.s., showing arrangement of ovules, general view - Liliium, ovary t.s., ovule shows embryosac with the megaspore mother cell, resting stage - Liliium, ovary t.s., embryoac showing the anaphase of the second homeotypic division with two division figures - Liliium, ovary t.s., mature eight nucleate embryosac with egg cell, synergidae, polar nuclei and antipodal cells - Liliium, I.s. of stigma with pollen and pollen tubes - Liliium, I.s. of growing pollen tube, showing the division of the generative cell into two sperm nuclei - Solanum, potato, t.s. of ovary with formation of embryos - Capsella, shepherd's purse, I.s. of ovule with embryos in situ - Monocot flower bud, t.s. shows floral diagram - Dicot flower bud, t.s. shows floral diagram - Arum maculatum, cuckoopint, I.s. of flower, insect trap - Lycopersicum, tomato, t.s. of flower bud shows floral diagram and axile placentation - Phaseolus, bean, t.s. of pod showing pericarp and seed - Papaver, poppy, t.s. of flower shows parietal placentation - Solanum tuberosum, potato, t.s. flower bud for floral diagram - Taraxacum, dandelion, I.s. of composite flower with tubular and ligulate florets - Taraxacum, dandelion, composite flower, colour graphic design - Taraxacum, t.s. of composite flower - Cocos nucifera, coconut, endosperm t.s. - Citrus, lemon, young fruit t.s. - Triticum, wheat, t.s. of seed (grain) showing seed coat, endosperm with stored starch and embryo, entire view - Triticum, I.s. of seed (grain) showing all details, entire view, medium magnification - Triticum, I.s. through the embryo showing growing point of the stem, leaf origin, scutellum, primary root - Triticum, wheat, seed (grain), colour graphic design - Zea mays, corn, grain (seed) I.s. embryo and endosperm.

Cat #: JL-15ST

Plant Anatomy 1: Phanerogams, Flowering Plants Overheads



30 Overheads

Atlas of 30 Overhead-Transparencies size 22 x 28 cm, comprising 122 pictures of colour photomicrographs and photomacrographs. With comprehensive interpretation text and 122 drawings and designs. In strong plastic file with ring-mechanism. - By Dr. Dieter Gerlach and Johannes Lieder.

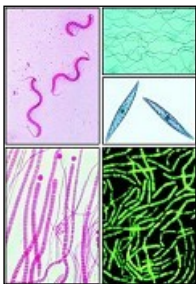
Cells and Cell Organelles: Raphide producing cells and meristematic cells from the tip of Hyacinth root - Nuclear membrane of an epidermal onion cell, tetracycline fluorescence - Mitochondria and proplastids of an epidermal onion cell, phase contrast - Cells from a Vallisneria spiralis leaf, interference contrast - **Plastids:** Chloroplasts with grana from cells of a Tradescantia

shoot - Chromoplasts from a nasturtium (*Tropaeolum majus*) petal - Chromoplasts from a carrot root (*Daucus carota*), dichroism - Starch containing leucoplasts (starch grains, amyloplasts) from a potato tuber (*Solanum tuberosum*) - **Nuclear Division and Cell Division in Meristematic Hyacinth Root Tip Cells:** - Interphase - Early and late prophase - Metaphase - Early and late anaphase - Early and late telophase - **Vacuole and Cell Wall:** Concave and convex plasmolysis - Cell walls of medulla cells of virgin's bower (*Clematis vitalba*) - Bordered pits from pine tracheids (*Pinus silvestris*) - Spherosomes. **Storage in the Cell:** Spherosomes in epidermal onion cells (*Allium cepa*) - Aleurone grains and fatty oil in the endosperm of a *Ricinus communis* seed - Tannins from a rose shoot - Oxalate crystals in onion scale cells - **Meristem. Parenchyma. Aerenchyma. Epidermis:** Meristematic tissue from the tip of an onion root (*Allium cepa*) - Parenchyma tissue from a crowfoot root (*Ranunculus* sp.) - Aerenchyma from a shoot of *Juncus effusus* - Epidermal cells from an agave leaf (*Agave americana*) - **Trichomes and Emergences:** Papillae of a pansy petal (*Viola tricolor*) - Glandular trichome of butterwort (*Pinguicula* sp.) - The stinging hair of the nettle (*Urtica dioica*) - Prickle of a rose shoot (*Rosa* sp.) - **Supporting Tissue:** Angular collenchyma from a stinging nettle shoot (*Urtica dioica*) - lamellar collenchyma from an elder shoot (*Sambucus nigra*) - Stone cells from the pith of a shoot of *Hoya carnosa* - Sclerenchyma fibres from the bark of an oleander twig (*Nerium oleander*) - **Conducting Tissue:** Tracheids from pine wood (*Pinus silvestris*) - Vessel with partly annular, partly helical secondary wall structure and pitted vessel from a rhubarb shoot (*Rheum* sp.), acridine orange fluorescence - Vessels with tyloses from the wood of false acacia (*Robinia pseudo-acacia*.) - Sieve cells from pine bast (*Pinus silvestris*) - Sieve tubes and companion cells from a gourd shoot (*Cucurbita pepo*), longitudinal section - Sieve plates from a bryony shoot (*Bryonia* sp.) c.s. - Callose on sieve plates of grape in winter (*Vitis vinifera*) - **Vascular Bundles and their Arrangement in the Shoot:** Closed collateral vascular bundle from a maize shoot (*Zea mays*) - Arrangement of the vascular bundles in a maize shoot - Vascular bundle from a creeping crowfoot (*Ranunculus repens*) c.s. - Arrangement of the vascular bundles in a creeping crowfoot shoot - Bicollateral, open vascular bundle from a gourd shoot (*Cucurbita pepo*) - Concentric, amphivasal vascular bundle from a lily-of-the-valley rhizome (*Convallaria majalis*) - Wheat shoot (*Triticum* sp.) c.s. - Lily-of-the-valley rhizome c.s. - **Secondary Growth of the Shoot:** *Aristolochia siphon* shoot c.s. (Green birthwort) - Fascicular and interfascicular cambium from shoot of *Aristolochia* c.s. - *Aristolochia* shoot, several years old c.s. - Sunflower shoot (*Helianthus annuus*) c.s. - **Pine Wood and Bast:** Pine wood (*Pinus silvestris*) c.s. - Radial section through pine wood - Tangential section through pine wood - Pine bast c.s. - **Lime Wood and Bast:** Wood and bast of the lime tree (*Tilia* sp.) c.s. - Lime wood (*Tilia* sp.) c.s. - Bast of lime c.s. - **Secondary Growth in Monocotyledons. Periderm and Bark:** Dragon-tree shoot (*Dracaena* sp.) c.s. - Periderm from an elder shoot (*Sambucus nigra*) c.s. - Fully developed and developing lenticel from an elder shoot c.s. - Pine bark (*Pinus silvestris*) c.s. - **Vegetative Shoot Apex. Structure of the Leaf:** Vegetative shoot Apex from the tip of a water-weed shoot (*Elodea canadensis*) - Hellebore leaf (*Helleborus niger*) c.s. - Vascular bundles from a hellebore leaf (*Helleborus niger*) c.s. - Lower epidermis of the tulip leaf (*Tulipa* sp.). Seen from the surface -

Stomata and Leaf Stalk: Stomata from a hellebore leaf (*Helleborus niger*). Seen from the surface. Interference contrast - Stoma from a hellebore leaf c.s. - Leaf stalk of the horse-chestnut (*Aesculus hippocastanum*) c.s. - Abscission zone at the base of the horse-chestnut leaf stalk c.s. - **Leaf Structure and Habitat:** Maize leaf (*Zea mays*) c.s. - Sun and shade beech leaves (*Fagus sp.*) c.s. - Oleander leaf (*Nerium oleander*) c.s. - Pine needle (*Pinus silvestris*) c.s. - **The Root:** Tip of a hyacinth root (*Hyacinthus sp.*) - Root cap from maize (*Zea mays*) with statoliths l.s. - Development of vascular bundles in a barley root (*Hordeum vulgare*) c.s. - Root hairs from a maize root (*Zea mays*). Interference contrast - Iris root (*Iris germanica*) c.s. - Central Cylinder of a Crowfoot root (*Ranunculus sp.*) - Formation of Lateral roots in the Broad Bean (*Vicia faba*) c.s. - Areal root of *Dendrobium* with *Velamen Radicum* c.s. - **Secondary Growth of the Root. Symbiosis:** Formation of the cambium in the root of a marsh marigold (*Caltha palustris*) c.s. - Pine root (*Pinus silvestris*) c.s. - Root of *Neottia nidus-avis* with endomycorrhizae c.s. - Root nodule from a lupin (*Lupinus luteus*) with nodule bacteria c.s. - **The Flower:** The lily flower (*Lilium sp.*) c.s. - Cherry flower (*Prunus avium*) l.s. - Anther from a lily (*Lilium sp.*) c.s. - Pollen grain from a lily c.s. - **Meiotic Nuclear Division in Pollen Mother Cells of the Lily:** Pollen mother cells of the lily (*Lilium sp.*) c.s. - Leptonema - Zygonema - Pachynema - Early (top left) and late diplonema (top right) - Diakinesis - Metaphase I - Anaphase I - Telophase I - Tetrad of microspores - Division of the microspore nucleus. Telophase - **Structure of the Ovary. Structure and Development of the Embryo Sac:** Ovary and ovules of the lily (*Lilium sp.*) c.s. - Ripe embryo sac of the lily l.s. - Megaspore mother cell of the lily - Anaphase II of meiotic division of the megaspore mother Cell of the lily - **Pollen Tube. Double Fertilization. Development of Embryo and Endosperm:** Pollen tube of the lily and division of the generative nucleus - Double fertilization in lily (*Lilium sp.*) - Early and late stages in the Development of embryo and endosperm in shepherd's purse (*Capsella bursa pastoris*) - **Development of Seed and Fruit:** Shepherd's Purse Fruit with Seeds (*Capsella bursa pastoris*). Seeds both in cross section and in longitudinal section - Young apple fruit (*Pirus malus*) c.s. - Wheat caryopsis (*Triticum sp.*) l.s. - Wheat embryo l.s.

Cat #: JL-16ST

Plant Anatomy 2: Cryptogams, Non-Flowering Plants Overheads



30 Overheads

Atlas of 30 Overhead-Transparencies size 22 x 28 cm, comprising 128 pictures of colour photomicrographs and photomacrographs. With comprehensive interpretation text and 128 drawings and designs. In strong plastic file with ring-mechanism. By Dr. Dieter Gerlach and Johannes Lieder.

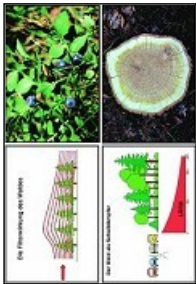
Schizophyta: Schizomycetes (Bacteria): Bacteria from the film on the teeth, carbol-fuchsin - *Treponema pallidum* in the liver, Levaditi's silver impregnation - *Mycobacterium tuberculosis*, Ziehl-Neelson's stain - *Streptomyces griseus*, carbol-fuchsin - *Bacillus megaterium*, cell walls, tannin-methyl violet - *Bacillus megaterium*, nuclear equivalents, acridin-orange- Fluorescence -

Rhodospirillum rubrum, purple bacterium, carbol-fuchsin - Flagellated bacteria from putrescent water - *Bacillus subtilis*, hay bacillus - *Closterium tetani*, Loeffler's spore stain - **Cyanophyceae (Blue-Green Algae):** *Gloeocapsa sp.* - *Nostoc sp.* - *Rivularia sp.* - *Oscillatoria sp.*, chromato- and centropiasm, acridine orange-fluorescence - *Oscillatoria*, volutin spheres - **Pyrrhophyta (Fire Algae):** Different dinoflagellates - *Ceratium hirundinella* with dinocaryon - *Noctiluca miliaris* - **Euglenophyta:** *Euglena sp.* - **Chlorophyta (Green Algae) Chlorophyceae:** *Chlamydomonas reinhardtii* - *Haematococcus sp.* - *Volvox sp.* - *Chlorella fusca* - *Pediastrum sp.* - *Hydrodictyon sp.* - *Ulothrix sp.* - *Oedogonium sp.* - *Chaetophora sp.* - *Cladophora sp.* - **Conjugatophyceae:** *Spirogyra sp.*, conjugating - Different desmidiates - **Charophyceae:** *Chara sp.*, tip of the thallus with apical cell - *Chara sp.*, oogonium and antheridiophore, l.s. - **Xanthophyta (Yellow Algae):** *Ophiocytium majus* - *Tribonema aequale* - *Vaucheria sessilis* - *Vaucheria sessilis*, oogonium and emptied antheridium - **Chrysophyta: Bacillariophyceae (Diatoms):** *Navicula sp.* - *Pinnularia nobilis*, structure of the shell - *Surirella sp.*, mitosis - *Melosira varians*, formation of auxospores - **Paeophyta (Brown Algae):** *Ectocarpus sp.*, plurilocular gametangia - *Sphacelaria sp.*, thallus with apical cell and unilocular sporangium, l.s. - *Dictyota dichotoma*, apical cells - *Dictyota dichotoma*, thallus with unilocular sporangium, c.s. - *Laminaria sp.*, phylloid with sporangia, c.s. - *Laminaria hyperborea*, male and female gametophyte and young sporophyte - *Fucus vesiculosus*, male conceptacles with antheridia - *Fucus vesiculosus*, female conceptacles with oogonia - **Rhodophyta (Red Algae):** *Polysiphonia sp.*, antheridia - *Polysiphonia sp.*, cystocarp - *Polysiphonia sp.*, tetrasporangium - *Batrachospermum sp.*, branched filaments with trichogyne and carposporophyte - **Mycophyta (Fungi): Myxomycetes:** *Diderma sp.*, plasmodium - *Plasmodiophora brassicae*, plasmodia and spores - **Phycomycetes:** *Saprolegnia sp.* - *Peronospora parasitica* - *Albugo candida*, oogonia and oospores - *Mucor mucedo*, black bread mould, sporangium - *Pilobolus sp.*, sporangiophores with sporangia - *Rhizopus sp.*, zygospore formation - **Ascomycetes:** *Saccharomyces cerevisiae*, baker's yeast, sprouting cells - *Taphrina pruni* - *Erysiphe sp.*, with cleistothecia - *Aspergillus sp.*, conidiophore with conidia - *Claviceps purpurea*, ergot, stroma with perithecia - *Peziza sp.*, hymenium of an apothecium - *Morchella sp.*, morel, asci with ascospores - *Tuber rufum*, truffle, fructification with hymenium, c.s. - **Basidiomycetes:** Basidiomycete living in wood, mycelium with clamp connections - *Psalliota sp.*, pileus with lamellae, c.s. - *Coprinus sp.*, hymenium of a young fructification, c.s. - *Sclerotinia vulgare*, c.s. of the fructification - *Puccinia graminis*, black rust of grain, pycnia and aecidia on a barberry leaf - *Puccinia graminis*, uredium with urediniospores - *Puccinia graminis*, telium with teliospores - *Ustilago hordei*, covered smut of barley, promycelia with copulating hyphae - **Fungi imperfecti:** *Epidermophyton floccosum* - **Lichenes:** *Physcia sp.*, c.s. of the thallus - *Physcia sp.*, apothecium with asci, c.s. - *Pleurococcus sp.*, green alga of the bark, enclosed by hyphae of a lichenous fungus - **Bryophyta: Hepaticae (Liverworts):** *Marchantia*

polymorpha, thallus with air chambers, c.s. - Marchantia, gemma-cup with gemmae, c.s. - Marchantia, antheridia, l.s. - Marchantia, archegonium, l.s. - Marchantia, sporogonium with spore capsule, l.s. - Marchantia, spores with elaters, polarisation - **Musci (True Mosses):** Tortula sp., gametophyte with sporophyte, w.m. - Sphagnum sp., sporogonium, l.s. - Sphagnum sp., c.s. of the stalk - Sphagnum sp., leaf - Polytrichum sp., c.s. of the stalk - Polytrichum sp., leaflets, c.s. - Mnium sp., antheridia, l.s. - Mnium sp., archegonia, l.s. - Mnium sp., capsule, l.s. - Mnium sp., protonema - **Pteridophyta: Steles:** Psilotum triquetrum, protostele from a young shoot, c.s. - Psilotum triquetrum, actinostele from an older shoot, c.s. - Lycopodium clavatum, stem with plectostele, c.s. - Pteridium aquilinum, rhizome with polystele (dicyclic solenostele), c.s. - Adiantum sp., maidenhair, rhizome with amphiphloic siphonostele, c.s. - Polypodium sp., polypody, rhizome with dictyostele, c.s. - Osmunda regalis, flowering fern, rhizome with stele, c.s. - Equisetum sp., horse-tail, stem with eustele, c.s. - **Pteridophyta: Stem and Root:** Equisetum sp., horse-tail, stem, l.s. - Equisetum sp., apex of the stem, l.s. - Isoetes sp., quillwort, c.s. of the stem - Pteridium sp., brake, c.s. of the root - **Pteridophyta: Filicatae (Ferns) Reproduction:** Ophioglossum sp., adder's tongue, sporophyll with developing sporangia, l.s. - Aspidium sp., shield fern, leaf with sorus, c.s. - Phyllitis scolopendrium, hart's tongue, sporangium with annulus - Fern Protonema, transition from the filiform to the plane stage - Plane prothallium of a fern - Fern, prothallium with antheridia and spermatozooids - Fern, prothallium with archegonia, l.s. - Fern, prothallium with young sporophyte - **Pteridophyta: Sporangia:** Lycopodium clavatum, common club moss, sporophyll with sporangia, l.s. - Psilotum triquetrum, primitive fern, synangium, c.s. - Equisetum sp., horse-tail, sporophylls with sporangia, c.s. - Selaginella sp., sporophylls with micro- and macrosporangium - **Spermatophyta: Pinidae, Reproduction:** Laryx europaea, larch, pollen grain, c.s. - Pinus silvestris, pine, cover scale, megasporophyll and ovule, l.s. - Pinus silvestris, archegonium, l.s. - Pinus silvestris, seed with embryo, l.s.

Cat #: JL-10ST

The Forest, Essential to Life Overheads



30 Overheads

Atlas of 30 OHP Transparencies size 22 x 28 cm, comprising 81 colour pictures, some with several component figures (drawings, diagrams, tables, designs and photographs of plants and animals, photomicro- and macrographs, life cycles, scenes, landscape photographs). In strong plastic file with ring-mechanism. - Compilation and text: Hartmut Dietle. This series of overhead projector transparencies presents plants and animals typical of the various forest types and their margins. The text introduces into the biology of species, informs about various interrelations between plants, animals, and humans in the ecosystem „forest", and explains the vital functions of the forest. Instructive graphs are added. Forest, not only in Central Europe, is threatened by excessive lumbering, demand of agricultural areas, construction of houses, roads, ski-lifts etc., as well as by human-made environmental pollution. As forest means life, it is necessary and vital to give information and knowledge about forest and its problems. The forest as an ecological system. Plants and animals of the wood. The multifarious functions of the forest.

Trees of the Forest - Mixed deciduous forest - Spruce (*Picea excelsa*) monoculture - Silver fir (*Abies alba*) - Spruce (*Picea excelsa*) - Pine (*Pinus silvestris*) - Douglas fir (*Pseudotsuga taxifolia*) - European larch (*Larix decidua*) - Common beech (*Fagus sylvatica*) - Stone oak (*Quercus sessilis* or *petraea*) - Winter lime (*Tilia ulmifolia*) - Black alder (*Alnus glutinosa*) - Ash (*Fraxinus excelsior*) - Mountain ash or rowan tree (*Sorbus aucuparia*) - White or canoe birch (*Betula pendula*) - European mountain maple (*Acer platanoides*).

The Layers of the Forest - Moss cushion (*Polytrichum*) - Moss (*Mnium*) with capsules - Horsetail (*Equisetum sylvaticum*) - Horsetail, spores with hapters - Shield fern (*Aspidium*), leaflets with sori - Fern gametophyte (Prothallium) with antheridia and archegonia - Mushroom (*Xerocomus badius*) - Mushroom: basidia and basidiospores of ink-cap (*Coprinus*) - Flowering plants: anemones (*Anemone*) and woodruff (*Asperula*) - Wood sorrel (*Oxalis*): soil indicator - Mezereum (*Daphne*): soil indicator - Arum (*Arum maculatum*) - Blueberry (*Vaccinium myrtillus*) - Shrub layer: blackthorn (*Prunus spinosa*), whitethorn (*Crataegus*) - Shrub layer: hazel (*Corylus avellana*), wild rose (*Rosa*) - Step-shaped forest margin - Layers of the forest, graph - Flat and deep rooting plants, graph - Ladies tresses (*Neottia*), root with endotrophic mycorrhiza, t.s.

The Forest During the Seasons - Opening bud - Beech seedling - Maple seedling (*Acer platanoides*) - Seedling of silver fir (*Abies alba*) and pine (*Pinus silvestris*) - Male flower of pine - Female flowers of pine - Cones of silver fir and spruce, comparison - Natural regeneration of forest - Summer aspect of forest - Sun- and shade-leaf of beech, t.s. - Annual rings, t.s. of oak stem - Colouring of leaves in autumn - Dispersal of fruits and seeds, graph - Forest in winter: protection of animals.

Animals of the Forest - Life on and in the forest floor - Red wood ant (*Formica rufa*) - Wood snipe (*Scolopax rusticola*) - European fir titmouse (*Parus ater*) - Black woodpecker (*Dryocopus martius*) - Crossbill (*Loxia curvirostra*) - Pellets of an owl (*Strix aluco*) - Spruce engraver- or bark-beetle (*Cryphalus picea*) imago and larva (pests) - Engraving pattern of spruce engraver-beetle - Gypsi moth (*Lymantria monacha*), imago (pest) - Roebuck and roe (*Capreolus*) - Fraying roebuck - Silver fir damaged by roes - Red fox (*Vulpes vulpes*) - European squirrel (*Sciurus vulgaris*) - Tree marten (*Martes martes*).

Functions and Endangering of the Forest - Erosion caused by deforestation - Fireweed (*Epilobium angustifolium*) growing on clearings - Forest holds the soil on steep slopes - Forest stores water: wood brook - Filter effect of forest, graph - Forest and residential areas, exchange of air, graph - Forests are sound absorbents, graph - Forest improves climate - Forest, a recovering resort - Wild waste disposal at forest margin - Wilful destruction of tree bark - Offence against forest law: improper felling of birches - Destruction of forest by ski-lifts - Effects of environmental pollution: yellowed needles - Effects of sour rain: dying spruces - Dying forest ("waldsterben") due to air pollution - Lichens on trees are bio-indicators for air pollution.

Cat #: [JL-12ST](#)

Ecosystems and Biological Communities Overheads



42 Overheads

Atlas of 42 OHP Transparencies size 22 x 28 cm, comprising over 210 colour pictures, mostly with several component figures (drawings, diagrams, tables, schemes, landscape photographs and pictures, nature photographs, photomicrographs and -macrographs, scenes, diagrammatic designs, test data and results). The series is designated for use in all types of schools, secondary schools, colleges and adult education. - Compilation: Dr. Rainer Ertel and Dr. Bernd Zucht.

Natural biological communities become rarer and rarer. Their abundance of species, the problems of their preservation as well as their importance for the whole ecological structure, even for inconspicuous microhabitats, are treated in these series on hand and documented by characteristic examples. Almost all of the details are photographed in their natural site to secure the greatest possible authenticity. The included texts give detail information on the biology of the species as well as on the development and ecology of the biotope.

Ecosystem Pond - Plant Society - Pond on working days - Pond on weekends - Zone of warping (picture) - Zone of warping (diagram) - Plant living submerged: *Chara* sp. - Plant with submersed leaves: water buttercup (*Ranunculus aquatilis*) - Plant with submersed leaves: water milfoil (*Myriophyllum* sp.) - Plant with submersed leaves: water pest (*Elodea canadensis*) - Plant with floating leaves: yellow and white pond lily (*Nuphar* sp.) - Plant with floating leaves: water aloe (*Stratiotes aloides*) - Reed bed: reed (*Phragmites communis*) - Reed bed: cat-tail (*Typha latifolia*) - Reed bed: bur-reed (*Sparganium erectum*) - Shallow water: water plantain (*Alisma plantago-aquatica*) and duck weed (*Lemna* sp.) - Shallow water: arrow head (*Sagittaria sagittifolia*) - Shallow water: iris (*Iris sibirica*) - Shallow water: marsh trefoil (*Menyanthes trifoliata*) - Shallow water: horsetail (*Equisetum fluviatile*) - Shallow water: mare's tail (*Hippuris vulgaris*) - Sedge belt: swamp-rush (*Heleocharis* sp.) - Forest peat - Village pond - Artificial scenery with ponds - School pond.

Ecosystem Pond - Animal Society - Zone of warping of a pond with animals, schematic figure - Fresh-water jellyfish, *Craspedacusta* sp. - Moss animal (Bryozoa) - Fresh water Snail, *Planorbis orbicularis* - Fresh water Snail, *Puccinea putris* - Fresh water Mussel, *Unio* sp. - Reed Spider, *Aranea cornuta* - Malaria Mosquito, *Anopheles* spec. - Alder Fly (Drone Fly), *Sialis lutaris* - Damselfly, *Coenagrion* - Dragonfly, *Aeschna cyanea* - Water Strider (Skipper), *Gerris* sp. - Carp, *Cyprinus carpio* - Pike, *Esox lucius* - Frog, *Rana esculenta* - Frog spawn, *Rana esculenta* - Ring Snake (Common Grass Snake), *Natrix natrix* - Great Reed Warbler, *Acrocephalus arundinaceus* - Little Bittern, *Ixobrychus minutus* - Coot, *Fulica atra* - Gadwall, *Anas strepera* - Great Crested Grebe, *Podiceps cristatus* - Muskrat, *Ondatra zibethica* - Water Shrew, *Neomys fodiens*.

Ecosystem Puddle - Melt-water puddle in the mountains - Frogs in snow-puddle - Red coloured puddle, caused by flagellates - *Euglena sanguinea*, unicellular red flagellate - Lowland puddle - Branchipus - Waterflea, *Daphnia* and *Ephippium* with winter eggs - Cartwheel trace with toads, *Bombina* - Fire-bellied Toad, *Bombina variegata* - Wood puddle - Molge in wood puddle, *Triturus alpestris* - Small puddle in root region of fallen tree - Water Striders in a puddle, *Gerris* sp.

Ecosystem Moor - Formation of an upland moor I: zones of warping of ponds (diagram) - Formation of an upland moor II: low moor and forest peat (diagram) - Formation of an upland moor III: raised bog (diagram) - Bog with wool grass, *Eriophorum* - Forest peat - Upland moor (Raised bog) - Marginal slope of an upland moor - Peat Moss, *Sphagnum*, habitus - Leaf of peat moss, *Sphagnum*, with water-storage cells - Dying wood at the edge of a moor - Survival of plants in moors: Protection against suffocation by peat moss *Sphagnum* (diagram) - Hummoks and hollows - Fenberry, *Vaccinium oxycoccus* - Blueberry, *Vaccinium myrtillus*, flowers and fruits - Cranberry, *Vaccinium vitis-idaea* - Heather, *Erica*. Ling, *Calluna* - Black Crowberry, *Empetrum nigrum* - Star Moos, *Mnium* - Sedge Grass, *Carex pauciflora* - Sundew, *Drosera* - Butterwort, *Pinguicula* - White Birch, *Betula pubescens* - Moor pine, *Pinus montana* - Peat cut - Back-swimmers, *Notonecta glauca* - Moor Frog, *Rana arvalis* - Common Viper, *Vipera berus* - Black Crouse, *Lyrurus tetrix*.

Ecosystem Forest - Schematic figure of the sections of the wood - Moss, *Polytrichum* (soil protection) - Clubmoss, *Lycopodium* (soil protection) - Fern, *Aspidium*, (soil protection) - Blueberry, *Vaccinium myrtillus*, (soil protection) -

Privet, *Ligustrum vulgare* - Whitethorn, *Crataegus oxyacantha* - Holly, *Ilex* sp. - Spruce, *Picea* sp. - Beech, *Fagus silvatica* - Red Ant, *Formica rufa* - Shepherd Spider, *Opilio* sp. - Crab Spider, *Thomisus* sp. - Camberwell beauty (butterfly), *Nymphalis antiopa* - Common Yellow Underwing (butterfly), *Noctua pronuba* - Long Horned Beetle, *Cerambyx cerdo* - Stag Beetle, *Lucanus cervus* - Scolytid Beetle, *Ips typographus*, gallery design - Grass Frog, *Rana temporaria* - Toad, *Bufo bufo* - Common Lizard, *Lacerta vivipara* - Heron, *Ardea cinerea* - Goosander, *Mergus merganser*, breeding place - Goshawk, *Accipiter gentilis* - Capercaillie, *Tetrao urogallus* - European Woodcock, *Scolopax rusticola* - Tengmalm's Owl, *Aegolius funereus* - Black Woodpecker, *Dryocopus martius* - Crossbill, *Loxia curvirostra* - Common Shrew, *Sorex araneus* - Bank Vole, *Clethrionomys glareolus* - Yellownecked Field Mouse, *Apodemus flavicollis* - Red Squirrel, *Sciurus vulgaris* - Beach Marten, *Martes foina* - Red Deer, *Cervus elaphus*.

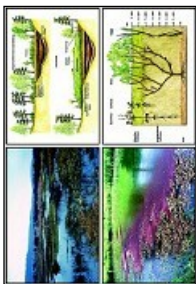
Ecosystem Alpine Meadows - Plants - Alpine meadow zone, schematic figure - Alpine meadow zone, landscape - Flora destroyed by winter sports - Crustose lichen, *Rhizocarpon geographicum* - Foliose lichen, *Haematomma* sp. - Alpine meadow grass, *Poa alpina* - Grassland, *Nardus stricta* - Fern, *Botrychium lunaria* - Alpine birch, *Betula nana* - Gentian, *Gentiana verna* - Gentian, *Gentiana punctata* - Alpine Rose, *Rhododendron ferrugineum* - Alpine Soldanel, *Soldanella* sp. - *Biscutella laevigata*, an Alpine crucifere - Rampion, *Phyteuma* sp. - Pasqueflower, *Anemona pulsatilla* - Mountain Avens, *Dryas octopetala* - Lion's Foot, (edelweiss), *Leontopodium alpinum* - *Lilium martagon*, an alpine lily - *Nigritella nigra* - *Orchis globosus*, an alpine orchid - Dwarf Pine, *Pinus mugo*.

Ecosystem Alpine Meadows - Animals - Ecological niches for the animals of the high mountain region - Alpine Blue Butterfly, *Lycaena* sp. - Painted Lady, *Vanessa cardui* - *Gaurotes virginea* - Alpine Carabid Beetle, *Carabus* sp. - Siberian Grasshopper, *Gomphocerus sibiricus* - European Black Salamander, *Salamandra atra* - Mountain Lizard, *Lacerta vivipara* - Golden Eagle, *Aquila chrysaetos* - Alpine Ptarmigan, *Lagopus mutus* - Water Pipit, *Anthus spinoletta* - Alpine Accentor, *Prunella collaris* - Wheatear, *Oenanthe oenanthe* - Snow Finch, *Montifringilla nivalis* - Alpine Chough, *Pyrrhocorax graculus* - Raven, *Corvus corax* - Snow Vole, *Microtus nivalis* - Blue Hare, *Lepus timidus* - Marmot, *Marmota marmota* - Ibex (Steinbock), *Capra ibex*.

Ecosystem Mud-flats (Shallows) - Shallow coast, schematic figure - Shallow coast, photograph - Shoal sand - Shoal mud - Animals, living in the shoal sand and mud (schematic figure) - Lugworm, *Arenicola marina* - Sea Annelid, *Nereis diversicolour* - Annelid, *Lanice conchilega* - Annelid, *Heteromastus filiformis* - Sea Mussel, *Mytilus edulis* - Mussels, *Scrobicularia plana* (Hen) and *Solenidae* sp. - Soft-shelled Clam, *Mya arenaria* - Common Periwinkle, *Littorina littorea* - Shallow Snail, *Hydrobia ulvae* - Common Cockle, *Cardium edule* - Shore Crab, *Carcinus maenas* - Shrimp, *Crangon crangon* - Shrimp fishing-boat - Plaice, *Pleuronectes platessa* - Marine Polychaete, *Nereis diversicolour* - Common Shelduck, *Tadorna tadorna* - Ringed Plover, *Charadrius hiaticula* - Dunlin, *Calidris alpina* - Oystercatcher, *Haematopus ostralegus* - Avocet, *Recurvirostra avosetta* - Curlew Sandpiper, *Calidris ferruginea* - Seal, *Phoca vitulina* - Baby-seal, *Phoca vitulina*, juvenile.

Cat #: [JL-24ST](#)

Environmental Damages to Animals and Plants Overheads



18 Overheads

Atlas of 18 Overhead-Transparencies size 22 x 28 cm, comprising over 80 colour pictures (photomicro- and macrographs, nature photographs, human photographs, electron micrographs, life cycles, drawings, diagrams, tables, scenes, test data and results). With comprehensive interpretation text. In strong plastic file with ring-mechanism. By Dr. Karl-Heinrich Meyer B.S. and Johannes Lieder.

The Wood: - Pine (*Pinus*), healthy leaves, t.s. - Pine (*Pinus*) leaves damaged by acid rain, t.s. - Fir (*Abies*), healthy leaves, t.s. - Fir (*Abies*), stem tip damaged t.s. - Beech (*Fagus*), healthy leaves t.s. - Beech (*Fagus*), t.s. of leaves with destroyed epidermis and chloroplasts - *Rhytisma acerinum*, tar spot of maples, consequence of single-crop farming - Early leaf fall, caused by thawing salt - Healthy lichen, indicator of clean air - Damaged lichen, caused by air pollution - Healthy wood of beech, t.s. - Wood destroyed by fungus - *Polyporus*, wood rot fungus, fruiting body t.s. - Root nodules of *Alnus*, with symbiotic bacteria - Spruce beetle (*Cryphalus picea*), larva t.s. - Wood with normal annual rings, t.s. - Wood with anomalous narrow annual rings caused by drought, t.s. - Bark with larval galleries of spruce beetle, t.s. - Pineapple-like gall on spruce caused by lice, t.s. - Gall nut on oak caused insects, t.s.

Water Pollution: - Intestinal bacteria (*Escherichia coli*) from putrid water - Putrefactive bacteria (*Spirillum*) from sludge poor in oxygen - Putrefactive bacteria (*Sphaerotilus*) bacteria, forming long chains with sheaths - Sludge bacteria (*Methanobacterium*) causing sewer gas - Sulphur bacteria (*Thiocystis*) - Wasserbluthe (*Microcystis*), blue-green alga "blooming" in stagnant water - *Anabaena*, blue green algae, in eutrophic water - *Spirogyra*, filamentous green alga in nutrient-rich water - *Spirulina*, corkscrew-shaped algae occurring in bitter seas - *Chlamydomonas*, one-celled green alga in eutrophic water - *Cladophora*, green alga with branching filaments from moderately polluted water - Diatoms, mixed algae from scarcely polluted water - *Euglena*, common green flagellates occurring in stagnant eutrophic water - Ciliates, different species from nutrient-rich water - Rotifers (*Rotatoria*), small animals

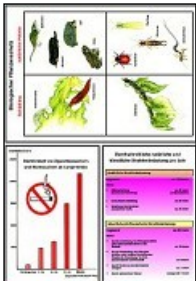
from putrid water - Tubifex, fresh water oligochaete, living in the sludge - Carchesium, bell-shaped stalked ciliate from moderately polluted water - Water mould (Saprolegnia), harmful to plants and animals - Skin of fish injured by chemicals, t.s. - Skin ulcer of an amphibian, t.s.

Life in the Soil: - Acidophile soil bacteria, solution of heavy metals - Nitrite bacteria, formatting harmful nitrogenous substances - Root of beech with ectotrophic mycorrhiza, t.s. - Root of birch with partly endotrophic mycorrhiza, t.s. - Root of lupin with symbiotic nitrogen fixing bacteria - Netted venation, portion of rotted deciduous leaf - Charlock (Sinapis), t.s. of stem. Green manure plant - Soil bacteria (Bacillus megatherium), smear - Hyphae of root fungi, t.s. - Lichen, indicator of clean air - Mushroom (Xerocomus), mycelium - Root of willow (Salix), planting protecting against erosion - Earthworm (Lumbricus) t.s., causing soil improvement - Springtails (Collembola), w.m. - Mite from forest soil, w.m. - Constituents of humus soil - Constituents of peaty soil.

Air Pollution and Allergens: - Pollen grains of different kinds of grass - Pollen grains of different deciduous trees - Pollen grains of different conifers - Mixed house dust - Dust mite from a living room - Spores of different fungi - Wood powder - Asbestos powder (cancerogenous) - Talcum powder - Crystals of washing-powder - Polyamide fibres - Nylon fibres - Mucous membrane of human nose, t.s. - Healthy human lung, t.s. - Human lung injured with dust particles, t.s.

Cat #: [JL-8ST](#)

Our Environment, Threats and Protection Overheads



36 Overheads

Atlas of 36 OHP Transparencies size 22 x 28 cm, comprising 74 colour pictures, some with several component figure (drawings, diagrams, tables, schemes, landscape photographs and pictures, scenes, nature photographs, photomicrographs and macrographs, diagrammatic designs, test data and results). In strong plastic file with ring-mechanism. - Compilation and text: Dr. Joachim Mueller.

Exemplifying dangers to the environment typical of Central Europe and methods of conservation practiced, this series of transparencies shall help the teacher to introduce universal valid and acute fundamentals of ecology and protection of the environment. Not only in Europe, but all over the world, mechanization of all areas of life and its consequences change the structure of nature, destroy our environment, and finally endanger the basis of our life. The newly curricula of all types of schools provide instruction of the subject complex "Environment - threats to environment - protection of environment". This series transparencies offers visual aids to improve this instruction. Typical examples show which processes are changing the natural structure of our environment and how the dangers arising from this can be counteracted.

I. The Landscape - Old type of land developed and cultivated by humans in Central Europe (colour photo) - Monoculture (colour photo) - Culture steppe (colour photo) - Woodland (colour photo) - Healthy trees (colour photo) - Sick forest (colour photo) - Distinctive marks of damaged trees (colour photo) - Stages of damaged tree - Natural course of a running water (colour photo) - Straightened course of a running water (colour photo) - Recultivation of a closed waste disposal site, general view (colour photo) - Ditto. diagram of transection - Stag heap (colour photo) - Incorporation of stag heap into the landscape (colour photo) - Nature reserves (colour photo) - Water reservation (colour photo) - Drinking water dams (colour photo) - Animals extinct or in danger of extinction in the 20th century, selection (table) - Heavily endangered animals, selection (table) - Plants extinct or in danger of extinction in the 20th century, selection (table) - Heavily endangered plants, selection (table).

II. Soil and Water - Average number of small animals in the top layer of meadows, pastures, and forests (table) - Unightly open dumping (colour photo) - Controlled waste disposal site, general view of site (colour photo) - Controlled waste disposal site, detail view (colour photo) - Controlled waste disposal site (diagram of structure) - Compostable and non-compostable components of waste (graph) - Composting of waste (diagram) - Wild burning of waste in the open country (colour photo) - Incinerating plant, function (diagram) - Introduction of sewage into a flowing water (colour photo) - Change of oxygen content of a flowing water caused by introduction of sewage (graph) - Full biological sewage plant (diagram) - Primary, mechanical treatment in a sewage plant: grit, sand catch (colour photo) - Primary, mechanical treatment in a sewage plant: primary sludge basin (colour photo) - Mechanical treatment in a sewage plant: function (diagram) - Biological treatment in a sewage plant: activated sludge basin (colour photo) - Ditto: activated sludge basin (colour photo) - Ditto: function of activated sludge (diagram) - Ditto: organisms of the activated sludge (drawing) - Ditto: drip towers (colour photo) - Ditto: drip towers, function (diagram) - Basin for secondary clarification (colour photo) - Chemical clarification of sewage (graph) - Causes for salting of surface- and ground water (graph) - Dangerous concentrations of harmful substances in the water (table) - Chemical pest control (colour photo) - Biological chain of pesticides (graph) - Biological pest control, pests and their natural enemies, selection - Biological pest control by plants (table) - Contamination of the environment with heavy metals (graph) - Accumulation of poisonous heavy metals in the food chain (graph).

III. The Air - Structure of the terrestrial atmosphere - Importance of the ozone layer (diagram) - Exposure to natural and human-made radiation (table) - Half-life of radioactive isotopes (table) - Main storage organs for radioactive isotopes (table) - Various radiations (table) - Sensitivity to radiation (table) - Types of smog (table) - Development of smog (diagram) - Effect of smog on humans (graph) - Consumption of air and oxygen by humans and motor vehicles (table) - Dangerous substances in exhausts from combustion motors (table) - Fluctuation of CO-concentration in the air of a main thoroughfare (graph) - Effect of CO on humans (table) - Plants damaged by polluted air (colour photo) - Buildings damaged by polluted air (colour photo) - Lichens indicate air pollution (colour photo) - Harmful substances in tobacco smoke and their effect on humans (table) - Mortality by lung cancer of cigarette-smokers and non-smokers (graph) - Power of various noises (graph) - Noise map of a big town (graph) - Effect of noise on humans (table).

Cat #: JL-9ST

Our Waters, Pollution, Protection and Recycling Overheads



42 Overheads

Atlas of 42 OHP Transparencies size 22 x 28 cm, comprising 118 colour pictures, some with several component figures (drawings, diagrams, tables, schemes, landscape photographs and pictures, nature photographs, photomicrographs and macrographs, technical photographs, test data and results). In strong plastic file with ring-mechanism. - Compilation and text: Prof. Dr. Otto Klee.

Due to progressing pollution, bathing in rivers, ponds, or lakes has become rather risky, drinking their water is dangerous. Technical requirements additionally changed the "water landscape".

This atlas of transparencies at hand informs about the dangers to our waters, treats general questions of pollution and clarification of surface waters, shows the importance of analysis and control, describes the methods of clearing sewages, and discusses natural treatment of flowing waters as well as steps to redevelop lakes.

Running and Standing Waters in Land Developed and Cultivated by Humans: Dynamic hydrosphere, diagram - Natural water cycle, diagram - Natural dynamic of water: waterfall - Clear mountain creek. Natural purification and oxygenation - Big stones on the banks of mountain creek - Creeks and rivers coming from wooded areas ensure steady flow and deep temperature - Correcting of the course and covering the banks with concrete depopulates a river and lowers the neighbouring ground water level - Cutting down trees and shrubs on river banks, a wrong step.

Natural Structure of a Running Water: Subdivision of a running water into head-waters, creek, river, and brackish water region, diagram - Morphology of a running water with upper, middle, lower reaches including erosion and sedimentation regions, diagram - Build-ups, weirs protect from high water and serve to raise the ground-water level - Line of water-level duration and profile of bank vegetation - Change of the transverse profile to shade the water and lower its temperature, diagram - Installation of small steps on the bed to raise the water-level - a) steps of local stone, - b) groynes and disturbing stones support the dynamic development of the water - Protected by trees and shrubs, the water gradually runs a natural course with undercut bank and slope. - Fish ladders improve biotope - Measures to protect flat and steep coasts, diagram - Active cliff - Marram grass (*Ammophila arenaria*) fixes shores and dunes.

Water Tests and Survey: Test of water quality: determination of temperature - Test of water quality: electrometrical determination of oxygen content, conductivity, and pH - Taking water samples: measuring contents of oxygen, conductivity and pH with electric gauge - Analysis of water in the laboratory - Fully automatic testing of water in laboratory installed close to a river.

Grades of Waters: Grade I: pure water zone of a mountain creek (oligosaprobic zone) - Bioindicators (organisms) of grade I (oligosaprobic zone) - Grade II: moderately polluted surface water (beta-mesosaprobic zone) - Bioindicators (organisms) of grade II = Moderately polluted zone (beta-mesosaprobic zone) - Grade III: heavily, critically polluted surface water (alpha-mesosaprobic zone) - Bioindicators (organisms) of grade III = heavily polluted zone (alpha-mesosaprobic zone) - Grade IV: extremely polluted superficial water (polysaprobic zone) - Bioindicators (organisms) of grade IV = extremely polluted zone (polysaprobic zone) - Extremely polluted water (grade IV, polysaprobic zone) of an oasis - Water grades between source and mouth of a river, graph - Subdivision of a running water according to degree of organic pollution, grades of saprobity, saprobity index, identifying colours, and oxygen minima - Chemical criteria for grades of biological pollution, table - Classification of running waters according to bacteriological findings.

Pollution of Waters by Introduction of Sewage: Cycle of organic substances in the water, diagram - Mouth of a sewage drain on the Mediterranean shore - Same place of shore with bathing persons. Extreme danger of infection ((cholera, typhoid, paratyphoid, enteritis) - Introduction of unprocessed sewage of a town with 100 000 inhabitants into a river - Introduction of dairy sewage into a standing water - Introduction of dyes into a brook - Creek, totally destroyed by hot effluents containing stains - Creek, extremely polluted with domestic sewage and waste - Effluents of an iron factory colour the water and the bed red-brown - Destruction of natural biocoenosis by deposition of non-ferrous metal sludge - Use of wood for poison dump killed trees by toxic quantities of chromate - Introduction of

liquid manure containing proteins causes formation of scum - Highly polluted effluents drawing out of cellulose plant - Ligninsulphonic acid contained in cellulose effluents colours creek dark - Consequence of introducing cellulose effluents: bacteria (*Sphaerotilus natans*) and fungi (*Leptomitites lacteus*) produce great quantities of mucilage - Oil floating on water - Physical, chemical, and biological processes decompose oil floating on water, diagram.

Eutrophication of Lakes and Running Water: Eutrophication of a river by introduction of phosphates and nitrates - Eutrophication (lack of oxygen) and pollution cause death of fish - Completely eutrophicated lake due to introduction of domestic sewage and liquid manure - Odours caused by microorganisms forming alga bloom, diagram - Mass reproduction of algae I: *Euglena viridis* - Mass reproduction of algae II: *Asterionella formosa* - Production of methane and hydrogen sulphide in the marginal zone of an eutrophicated lake - Mass reproduction of jellyfish in the sea indicates unbalanced biological equilibrium - Jellyfish, photograph.

Redevelopment and Restoration of Lakes: Unspoiled oligotrophic mountain lake - Polysaprobic lake with extreme alga growth - Phosphorus cycle in a lake, diagram - The lake, a phosphate trap: cause of accelerated refertilisation - trophication spiral, diagram - Reoligotrophication of lakes due to external and internal treatment, reduction of nutrient spiral to normal nutrient cycle, diagram - Reoligotrophication I: installation of deep water drain for various zones - Installation of deep water drain - Percentage biomass of the various alga groups after deep water drainage - Reoligotrophication II: addition of oxygen to deep water (hypolimnion), diagram - Reoligotrophication III: injection of nitrates for biochemical oxidation of reduced sediments - Manipulation of food chain: purposeful fishing of zooplankton-eating fish reduces algae-eating zooplankton - Manipulation of food chain: reduction of zooplankton-eating fish increases number of predaceous ones, diagram - Fishing manipulates food chain.

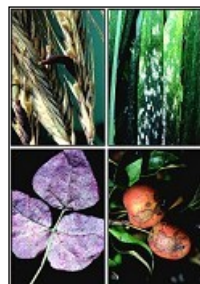
Purification and Protection of Waters, Methods: Removal of organic substances by mechanical and biological processes in sewage plants and recipients, diagram - Structure and function of a sewage plant - Retention of coarse particles by the grit - 1st Cleaning step - Size of particles in sewage, diagram - Fluctuations of urban sewage quantity during 24 hours, diagram, - Long sand catch with gauge for water quantity - Basin for primary sedimentation with clearing bridge - 2nd Cleaning step - Drip tower filled with synthetic elements - Section through a drip tower, diagram - Decrease of biochemical oxygen demand during 5 days indicates biological clarification - Biological clarification of sewage with diving cylinders. - View on a group of drip towers filled with synthetic elements to clear effluents from a paper mill - Drip tower with water circulation and filled with synthetic elements - General view of a modern full biological activated sludge plant - Turbines swirl and aerate - Aeration of activated sludge by bubbles - Aeration of activated sludge by tubes - Organisms in the activated sludge basin, diagram - Organisms in activated sludge I. *Vorticella microstoma* - Organisms in activated sludge II. *Rotaria rotatoria* - Clarification of sewage with pure oxygen, diagram - Supply with pure oxygen in closed system by surface aeration (Detroit, USA) - Biocoenosis of activated sludge treated with pure oxygen I: mass reproduction of *Carchesium polypinum* - Ditto. II: *Vorticella convallaria* - Basin for secondary sludge in big oxygen treatment sewage plant (Detroit, USA) - Flowover of the purified water - Function test by determination of sludge volume, sludge weight and sludge index, diagram - 3rd Cleaning step - Phosphate elimination by chemical precipitation in sewage plant - Denitrification eliminates nitrogen - Anaerobic sludge fermentation - Fermentation (digestion) of sludge in fermentation towers - Fermentation (digestion) in separate towers, diagram - Efficiency of various clarification steps in a sewage plant.

Acidification of Surface Waters - Biocides in Waters: Effects of sour rain on aquatic ecosystems, diagram - Lake in Sweden with high acidification - Toxic pH-limit in acid and basic range, diagram - Summary of various contacts of biocides with water, diagram - Accumulation of biocides in the food chain of various aquatic organisms - Direct entry of biocide sprays into the water.

Drinking Water - Summary: Future demand of water in Sweden (industrial, domestic), diagram - Introduction of surface water into a drinking water plant - Precipitation of unwelcome substances - Filtration with sand - Inconsiderate exploitation of water - Good use and processing of water.

[Cat #: JL-11ST](#)

Protecting Crops From Damage and Disease Overheads



30 Overheads

Atlas of 30 OHP Transparencies size 22 x 28 cm, comprising 101 colour pictures, some with several component figures (drawings, diagrams, tables, designs and photographs of plants and animals, photomicro- and macrographs, life cycles, scenes, nature photographs, landscape photographs). In strong plastic file with ring-mechanism. - Compilation and text: Hartmut Dietle and Dr. Anton Mittnacht.

Plants and vegetable products (stocks, store) have to be protected from pests and diseases to avoid economically important parts of plants to be quantitatively and qualitatively damaged. Preventive steps (plant hygiene) and direct protective measures (physical, biochemical,

biological, and chemical methods) are used by farmers, gardeners, and hobby gardeners in the defence of harmful plants and animals.

Economically Important Diseases of Plants - Powdery mildew of grain (*Erysiphe graminis*), ascomycete - Breaking stem of grain (*Pseudocercospora herpotrichoides*), fungus imperfectus - Brown spelt of grain (*Septoria nodorum*), fungus imperfectus - Bunt of wheat (*Tilletia tritici*), basidiomycete - Ergot on rye (*Claviceps purpurea*), ascomycete - Reduction disease of potato (various viruses) - Rottenness of potato (*Phytophthora infestans*) phycomycete - False mildew on vegetables (*Peronospora* sp.), phycomycetes - Mildew of cucumber (*Erysiphe cichoriacearum*), ascomycete - Bean rust (*Uromyces appendiculatus*), basidiomycete - Scab on fruit (*Venturia inaequalis* resp. *pirina*), ascomycete - Grey mould on fruit (*Botrytis cinerea*), fungus imperfectus - Fungus, a heterotrophic plant, graph - Polynucleate sprout of *Botrytis* spore allows gen combination, fungus imperfectus.

Photomicrographs of Fungi Causing Plant Diseases - Potato wart (*Synchytrium endobioticum*), infects tubers, t.s. - False mildew of grapes (*Plasmopara viticola*), leaf with conidiophores, t.s. - Clubroot of cabbage (*Plasmodiophora brassicae*) infected cells with young plasmodia, t.s. - Clubroot of cabbage (*Plasmodiophora brassicae*), host tissue with spores, t.s. - False mildew on cruciferae (*Peronospora parasitica*), t.s. - White smut (*Albugo candida*), mycelium and conidia, t.s. - Head mould (*Mucor mucedo*), zygomycete, sporangia with spores - Mould (*Rhizopus*), zygomycete, formation of zygospore - Disease of plums (*Taphrina pruni*), with asci and ascospores, t.s. - Scab on pears (*Venturia pirina*), conidia, t.s. - Ergot (*Claviceps purpurea*), perithecial head with asci, l.s. - Ergot (*Claviceps purpurea*), sclerotium formed of hyphae, l.s. - *Pilobolus*, sporophorous hypha with sporangium - Mildew on apple (*Podosphaera leucotricha*), conidiophores on leaf - *Penicillium*, mycelium and brush-shaped conidiophores - *Aspergillus*, mycelium and conidiophores - *Sclerotinia fructigena*, conidia on surface of fruit - Gray mould on onions (*Botrytis allii*), t.s of leaf. - Tar spot on maple leaf (*Rhytisma acerinum*), t.s. of sclerotium - Yeast (*Saccharomyces*), spore formation - Corn smut (*Ustilago maydis*), spores in tissue - Black stem rust of wheat (*Puccinia graminis*), urediniospores (yellow rust), on leaf of wheat t.s. - Black stem rust of wheat (*Puccinia graminis*), teliospores (black rust) on leaf of wheat, t.s. - Black stem rust of wheat (*Puccinia graminis*), aecidia on leaf of barberry.

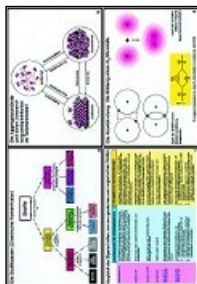
Vegetable Pests: Weeds - Table of weeds - Some common weeds - Four grasses competing with cultivated plants - Chalky soil loving plant: Charlock (*Sinapis arvensis*) - Acid soil loving plant: Wild radish (*Raphanus raphanistrum*) - Nitrogen loving plant: Common chickweed (*Stellaria media*) - Indicator of wetness: Horsetail (*Equisetum arvense*) - Weed in meadowland: Common dandelion (*Taraxacum officinale*) - Weed germinating in spring (*Avena fatua*) - Weeds germinating in summer: many seeded goosefoot or pigweed (*Chenopodium polyspermum*) - Weed germinating in autumn: chamomile (*Matricaria chamomilla*) - Weeds damage by deprivation of light, water, nutrients, space; graph - Erosion.

Economically Important Animal Pests - Piercing-sucking mouth parts of a bug, photomicrograph - Red spiders, Tetranychidae, on leaf of fruit tree - Codlin moth (*Laspeyresia = Carpocapsa pomonella*) - Apple weevil (*Anthonomus pomorum*), a snout beetle, Curculionidae - White fly (*Trialeurodes*), Aleyrodidae - Scale insect (*Coccidae*) on salad - Grain aphid (*Sitobium granarium*), Aphidae - Bitingchewing mouth parts of cockroach (*Periplaneta*) - Radish-root maggot (*Phorbia floralis*), Anthomyiidae - Beet leaf-miner (*Pegomyia betae*), Anthomyiidae - Rape beetle (*Meligethes aeneus*), Nitidulidae - Flea-beetle (*Phyllotreta vittata*), Chrysomelidae - European corn-borer (*Ostrinia = Pyrausta nubilalis*), Pyraustinae - Frit-fly (*Oscinella frit*), Chloropidae - Caterpillar of *Pieris brassicae*, Pieridae - Colorado potato beetle (*Leptinotarsa decemlineata*) Chrysomelidae - Radula of the slug *Deroceras*, Limacidae - Common garden slug (*Deroceras agreste*), Limacidae - Field mouse (*Microtus arvalis*), Muridae - Vole (*Arvicola terrestris*), Muridae - Sparrow, pheasant - Muskrat (*Ondrata cibethica*), Muridae.

Measures and Methods of Plant Protection - Cultivating the soil (ploughing, harrowing), protective measure - Preparation of the seed bed, protective measure - Selection of type, protective measure - Disinfection, treatment of seed, protective measures - Rotation of crops: sugar beets, winter wheat, summer grain, corn, field forage - Physical method of weeding - Mechanical method of weeding - Chemical methods of weeding - Steaming of the soil - Chemical measures: Distribution of the total quantity of active substance - Legal requirements: Law of plant protection; procedure of authorization - Legal requirements: Permissible consumer level - Importance of plant protection for business management and work - What happens with pesticides in nature? - Legal requirements: Protection of environment and bees - Research on metabolites in laboratory, gas chromatography - Biological measures: Ichneumon fly in greenhouse - Biological measures: Predative mites in greenhouse - Biological measures: Ladybird beetles against aphids - Biotechnical methods: Frightening by bang.

Integrated Protection of Plants - What is integrated protection of plants? - Integrated protection of plants in apple plantations - Economic damage limit - Light trap - Knocking method - Pheromone trap - Electronic scab warning instrument - Conventional method: Mills' table - Protection of useful animals.

Cat #: JL-17ST

The Structure of Matter Overheads, Part 1**35 Overheads**

Atlas of 35 OHP Transparencies size 22 x 28 cm, comprising 86 colour pictures with a great variety of details, mostly with several component figures (drawings, diagrams, tables, schemes, photomicrographs and -macrographs, electron micrographs, X-ray photographs, field emission micrographs, diagrammatic designs, technical photographs, test data and results). In strong plastic file with ring-mechanism. Compilation: Dr. rer. nat. Otto J. Lieder.

The structure of the matter is the object of world-wide research work. The present atlas contains a systematic survey of the respective research results and is designated for use in secondary schools and in classes of technical, physical and chemical colleges and adult education. Here a selected stock of pictures is placed at disposal, which in usual textbooks and education manuals is contained in a very limited size only.

The Composition of the Atom, Elementary Particles, Atomic Nuclei, Structure of the Atomic Shell - On the basis of selected examples the development from the ancient idea to the latest findings the fine structure of the matter is illustrated - The ancient idea of the elements as an answer to the question for the primary matter - Postulating of the atomic idea according to LEUKIPPOS and DEMOKRITOS - Conception of particles according to JOHN DALTON (atoms, atom bindings, molecules) - First structured atomic model of THOMSON - Scattering experiment of RUTHERFORD. Exploration of atomic dimensions and definition of the orbital model - Atomic model of NIELS BOHR (Quantization of particle energy) - Atomic model of ARNOLD SOMMERFELD - Matter waves (DE BROGLIE waves) as a proof of the double nature of matter and light - The HEISENBERG uncertainty relation and its consequences to the ideas of atomic structure - The quantum mechanical atomic model according to HEISENBERG and SCHROEDINGER - The atomic spectrum of hydrogen as the expression of electron transition within quantum energy stages of the hydrogen atom - General term diagram and spectral series of the alkali atoms H to -He - The conditions of origin of the three spectrum types - The solar spectrum. The FRAUNHOFER lines and the related chemical elements - The hydrogen isotopes and the atomic structure of the ten lightest elements according to NIELS BOHR - The symmetry of the simplest atomic orbitals and the structure of the atomic shell according to the orbital model.

Energy, Matter, Interactions - An attempt to give a clear idea of facts being not very vivid about the elementary particles of the matter through the description of possible interactions - The four interactions in elementary particles, their coupling constants - Matter and antimatter: The most important elementary particles and their properties and systematics - Models of the construction of atomic nuclei - The EINSTEIN equivalence principles of energy and matter - Diagramm of stable and unstable nuclides - Nuclear fusion, nuclear binding energy and mass defect - Nuclear fission as a simple nuclear reaction - Spontaneous nuclear disintegration by FERMI-interaction - The law of radioactive disintegration - Methods to proof nuclear reactions: WILSON's cloud chamber, GLASER's bubble chamber and the nuclear emulsion technique - Nuclear fission after HAHN, STRASSMANN and MEITNER - Nuclear evaporation by high-energy particles - Symmetry models of elementary particles - Subelementary particles and their hypothetical characteristics - Experiments for the detection of quarks resp. partons - Attempt of a "General field theory" by HEISENBERG.

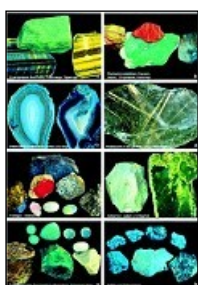
Classes of Matter, Properties, Chemical Bonding - Proceeding from the fundamentals of chemistry, inherent laws and correlations between the physical and chemical properties of the stuffs and the ideas of the atomic composition and chemical bonding are illustrated - The classes of the matter. Chemical nomenclature - The aggregate states and their changes after the particle model - Characteristics of anorganic and organic bonds - The most important general properties of the matter - The characteristic properties of the three types of elements - Possibilities of sigma- and pi-bonds - Atomic bond after the BOHR theory and the molecular orbital theory - Ionic bond. Electrodynamic interaction and electro-negativity of the elements - Metal bond - Polarization, transitional forms and diagrams of the bond types - Co-ordinative bond (semi-polar bond) - VAN DER WAALS forces - Hydrogen bonding - Types of hydrogen bonding - Ionic dissociation of salts, acids and bases - The electrolytic process and its educts - Typical substance with various bond-types - Polymerization and macromolecules.

Symmetry of Crystals, Properties of Minerals, Research into the Structure - Correlations between arrangement of the particle grating and the macro-symmetry of the crystallized matter are shown. Some macro-physical properties of solids being suitable as criterions for the determination of minerals. The principles of X-ray analysis of the structure. - The macro-symmetry, a visible result of the arrangement of the particle grating - Rational planes and angular constant - Electron micrograph of a metal surface - Electron micrograph of a virus protein crystal - The crystallographic symmetry elements - Survey over the crystal symmetries and the symmetry elements - The crystal symmetries in the crystal grating model - The crystal symmetries and the crystal forms - Transition stages of crystallization: cube, octahedron, rhomboid dodecahedron - The three-dimensional orientation of lattice planes in the crystal grating and the MILLER indices of the crystal faces - The stereographic projection - Perfect crystal and real structure with three dimensional distortions - Example for crystal twinning - Forms of crystal growth and crystal aggregates - Isotopy and macro-symmetry - Characteristics of the crystalline state - Colour, transparency and opacity - MOHS scale of hardness - Typical anisotropic effects on scratch hardness and thermic velocity of propagation - Forms of cleavability - Lattice structure and cleavability - The double refraction - Dichroism and

pleochroism - Double refraction and polarization of light waves - Orthoscopic interference figure of zinc selenite - Conoscopic interference figure of an uniaxial crystal - Conoscopic interference figure of a biaxial crystal - Polarization components - Extinguishing obliquities - Colour table after Michel-Lévy - Interference of light waves as an attempt for structure analysis of light diffracting matter - Interference of water waves - Conditions of light wave interferences - Diffraction on double slit for light waves - Conditions of X-ray interferences - X-ray diffraction after MAX VON DER LAUE as a method for structure analysis of crystalline matter - Simulated historic experimental set-up after MAX VON DER LAUE - LAUE pattern of a triclinic mineral - LAUE pattern of a monoclinic mineral - LAUE pattern of a rhomboid mineral - LAUE pattern of a trigonal mineral - LAUE pattern of a hexagonal mineral - LAUE pattern of a tetragonal mineral - LAUE pattern of a cubic mineral - Structure of beryllium - Beryllium, tourmaline, diopase - LAUE pattern of rocksalt - Numbered LAUE pattern of rocksalt - Radiographic method (powder photography) DEBEYE-SCHERRER - Examples of isotopic determination of substances by comparison of their powder photographs - Single crystal photograph after the BUERGER precession technique - Structure analysis by vector analysis of a PATTERSON function - Calculation of electron density by FOURIER analysis - Field emission microscope picture of a platinum peak - Field emission microscope picture of a tungsten peak - Proof of changing of atomic position on the surface of a platinum-iridium single crystal - Principle of field emission microscope.

Cat #: JL-18ST

The Structure of Matter Overheads, Part 2



27 Overheads

Atlas of 27 OHP Transparencies size 22 x 28 cm, comprising 204 colour pictures with a great variety of details, mostly with several component figures (drawings, diagrams, tables, schemes, photomicrographs and -macrographs, electron micrographs, X-ray photographs, diagrammatic designs, test data and results). In strong plastic file with ring-mechanism. - Compilation: Dr. rer. nat. Otto J. Lieder.

Morphology of the Minerals I. Elements and Bonds - The following series show the most important and well-known minerals in that state, which is for a collector the most common to find in the nature. The specimens for this selected normally are not treated. They show all the typical characteristics and enable therefore a sure identification of finds. From that minerals, which are often subject to variations of their appearance, two or more specimens are shown on one picture. Particular value was set on a correct reproduction of the natural colours and structures of the minerals. Crystal chemistry systematics of minerals - Classification of silicate minerals - 1. Elements - Graphite, fine aggregate - Diamond in kimberlite - Sulphur, rhomboid crystals - Native arsenic - Native copper as matrix - Native silver as crystal aggregate - Native gold on matrix quartz - Native bismuth, granular aggregate - 2. Sulphides and arsenides (ores) - Pyrite (fools gold), typical crystals - Marcasite (white iron pyrite) - Bornite (purple copper ore) - Chalcopyrite (copper pyrite) - Covellite - Chalcocite - Galenite (lead glance) - Sphalerite (false galena, zinc blende) - Wurtzite - Cinnabar, the most important mercury ore - Pyrrhotite (magnetic pyrite) - Stibnite (antimonite) - Niccolite (copper nickel) - Smaltite (scutterudite) - Molybdenite, on quartz - Realgar (natural red arsenic disulphide) - Orpiment (yellow arsenic) - Arsenopyrite (mispickel) - Proustite (light red silver ore) - 3. Halides (salts) - Halite (rock-salt) - Sylvite (sylvine) - Fluorite crystal (Derbyshire spar) - Carnallite, raw material for production of magnesium - Cryolite (Greenland spar, ice stone), for production of aluminium - 4. Oxides and hydroxides - Magnetite (magnetic iron ore) - Haematite (red iron-ore) - Corundum, emery and ruby - Rockcrystal (quartz crystal) - Chalcedony and agate - Common and precious opal - Rutile, important titanium ore - Cassiterite (tinstone), in matrix - Pitchblende (nasturan), uranium ore (radioactive) - Chromite (chromium iron ore) - Ilmenite (titaniferous iron ore) - Pyrolusite (manganese ore) - Perovskite, pseudocubic crystals on schist - Spinel, octahedron aggregate - Zincite (red oxide of zinc, spartalite) - Psilomelane - Goethite - Brucite - Bauxite, raw material for the aluminium production - Limonite (brown haematite), weathered iron ore - 5. Carbonates - Calcite crystal (calcspars) and Iceland spar rhombohedron - Dolomite rock (dolostone) - Siderite (iron spar, white iron ore) - Aragonite, large crystals - Cerussite (white lead ore) - Malachite (green carbonate of copper), cut and polished - Azurite (blue copper ore) crystal aggregate - Smithsonite (dry bone ore, calamine), crusty aggregate - Witherite, crystal aggregate - Magnesite - Rhodochrosite, cut - 6. Borates - Tincal (borax), crystals - Ulexite (cotton ball), fibrous aggregate, cut and polished - Boracite crystals in gypsum - 7. Sulphates, chromates, molybdates and wolframates - Gypsum, clear single crystal (spectacle stone) - Anhydrite (cube spar), palecoloured pieces - Barite (barytes, basofor) - Celestine (celestite) - Crocoite (red lead ore) - Wulfenite (yellow lead ore) - Wolframite, crystal - Scheelite (natural calcium tungstate) - 8. Phosphates, arsenates, vanadates - Apatite, crystals in matrix - Pyromorphite, prismatic crystals - Callaita - Monazite, crystals - Erythrite (cobalt bloom) - Annabergite (nickel bloom) - Wavellite, spherulithic aggregate - Descloizide, vanadium ore, crystals - Vanadinite, on matrix - Torbernite.

Morphology of the Minerals II. Silicates - This series presents 56 beautiful colour photographs of the most important minerals out of the large group of the silicates. Olivine in basalt - Garnet in mica-schist - Topaz crystal - Zircon crystal - Andalusite, stem-like aggregate - Disthene (cyanite), solid aggregate - Titanite (sphene), single crystals - Staurolite, twinning crystals - Hemimorphite (natural zinc silicate), crystals on matrix - Epidote, crystals - Zoisite, stem-like aggregate - Beryl, Blue variety 'aquamarine' - Cordierite (iolite), dichroitic crystals - Tourmaline, different colour varieties - Diopase on matrix - Chrysocolla, earthy substance - Diposide,, columnar crystals - Common and basalt augites, rock-forming silicates - Spodumene (triphane), lithium raw material - Jadeite, broken

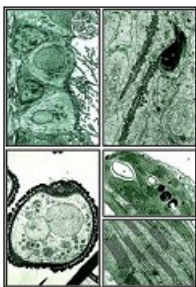
and cut pieces - Enstatite, broken piece - Bronzite, crystal intergrowth, - Hypersthene, broken piece - Tremolite, stem-like aggregate - Actinolite, prismatic crystals in solid talcum - Common hornblende, wide-spread rock-forming silicate - Basalt hornblende, typical crystals - Wollastonite (tubularspar), fibrous crystals - Rhodonite, solid granular concretion - Talcum, pale-coloured split piece - Prehnite, pale-coloured spherical aggregates - Muscovite (Muscovy glass), split piece - Phlogopite, tabular crystals - Biotite, split piece - Lepidolite, split piece - Fuchsite, flaky aggregate - Chrysotile (Canadian asbestos) - Antigorite - Nepheline (nephelite) in effusive rock - Leucite (white or Vesuvian garnet) in basalt - Analcime (analcite) on matrix - Orthoclase and aventurine feldspar (sunstone), split pieces - Microcline, split piece - Amazonite (amazonstone) crystals - Albite (pericline) - Labradorite, split piece with typical colouration - Anorthite, broken surface - Sodalite, broken surface - Hauyne, in porous lave - Lazurite (ultramarine), gem lapis lazuli - Natrolite, crystal bundle in drusy basalt - Harmotome, crystals - Stilbite (desmine), brown bundle on apophyllite (fish-eye stone) - Apophyllite (fish-eye stone), crystals - Tektite, glassy silicate of unknown origin - Moldavite (water-chrysolithe, bottle-stone), glassy silicate originated from meteoric striking.

Morphology and Microstructure of the Rocks - The macrophotographs give a picture of habit and structure of the surface of the most important rocks. Microphotographs of thin sections of the same sorts in polarized light demonstrate their inner structure in colourful pictures. Review and nomenclature of the types of rocks. Survey and nomenclature of the rock types - The chemistry of the eruptive rocks (magmatites) - Volcanics: Lave, pumice and obsidian - Intrusive rock granite - Thin section photomicrograph of granite - Intrusive rock granodiorite - Intrusive rock syenite - Thin section photomicrograph of syenite - Intrusive rock diorite - Thin section photomicrograph of diorite - Intrusive rock gabbro - Thin section photomicrograph of gabbro - Matrix rock granite porphyry - Thin section photomicrograph of granite porphyry - Matrix rock diabas - Thin section photomicrograph of diabas - Matrix rock pegmatite - Extrusive rock basalt - Thin section photomicrograph of basalt - Extrusive rock rhyolite (liparite) - Extrusive rock trachyte - Extrusive rock andesite - Clastic sedimentary rock sandstone - Thin section photomicrograph of sandstone - Clastic sedimentary rock greywacke - Clastic sedimentary conglomerate - Clastic sedimentary breccia - Chemical sedimentary rock travertine - Thin section photomicrograph of travertine - Biogenous deposit anthracite coal - Photo micrograph of the biogenous deposit diatomaceous earth - Pelitic metamorphic rock mica-schist (mica-slate) - Thin section photomicrograph of mica-schist - Sialic metamorphic rock gneiss - Thin section photomicrograph of gneiss - Carbonatic metamorphic rock marble - Thin section photomicrograph of marble - Regional metamorphic rock serpentine - Thin section photomicrograph of serpentine - Thin section photomicrograph of lunar rocks (basalt) - Thin section photomicrograph of lunar rocks (breccia and anorthosite) - Lunar rocks with lamellar structure caused by shock waves.

Gems and Precious Stones - This series also fascinates by the beauty and the great variety of details in its colour photographs. There are shown well known and economically interesting gems and precious stones. Forms and cuts of precious stones - Classification of gems and precious stones - Corundum group: ruby and sapphire - Beryl group: aquamarine and emerald - Beryl group: emerald - Spinelgroup: pleonaste (ceylonite) and magnesian spinel - Topaz varieties - Garnet group: pyrope, grossular and almadine - Tourmaline varieties - Spodumene group: Hiddenite (lithia emerald) and kunzite - Quartz group I: rock crystal, amethyst, cairngorm (smoky quartz), citrine, rose quartz - Quartz group II: aventurine, hawk's eye, tiger's eye - Chalcedony varieties: carnelian, jasper, chrysoprase, bloodstone - Rutil needles in quartz crystal (Venus hair stone) - Banded chalcedony varieties: agate and onyx - Opal varieties - Jade varieties: jadeite and nephrite - Feldspar group: sunstone (heliolithe), moonstone, amazonstone - Callaite and turquoise matrix.

Cat #: [JL-25ST](#)

Transmission Electron Micrographs Overheads



24 Overheads

Atlas of 24 OHP Transparencies size 22 x 28 cm, comprising over 120 individual pictures. They are made from extremely high quality, faultless and instructive transmission electron micrographs. All micrographs are marked with letters facilitating the location and interpretation of the important or special structures. Greatly enlarged electron micrographs - magnification 50000 up to 100000 x - show the ultra-structures of the cell organelles as far as the range of macromolecules. Electron micrographs of lower magnification - 5000 up to 30000 x - give an impression of the microstructure of the tissues and organs, their specific performance and functions. The resolution capability of a modern electron microscope is approximately 1000 times greater than that of the optical microscope. In strong plastic file with ring-mechanism. - Compilation: Dr. Heinz Streble.

Electron Micrographs of Animal Cells and Tissues: Technics: production of ultra-thin sections for electron microscopy - Electron microscope: composition and function, refraction and lenses - Liver cell: distinctive marks of fine structure; nucleus, mitochondria, cytosomes, lysosomes, dictyosomes, glycogen, gall capillaries - Liver cell: fine structure of an animal cell - Liver cell: details of cell organelles and endoplasmatic reticulum - Skin: desmosomes, tonofilaments, microvilli and fissures for lymph in stratum spinosum cells of epidermis - Ciliated epithelium of trachea: t.s. and l.s. of cilia - Cilia, flagella and their structures: t.s. of a group of cilia; three cilia are constructed divergently - Secretory cells: exocrine cells of pancreas, endoplasmatic reticulum and dictyosomes as origin structures of digestion enzymes - Ribosomes: fixed on membranes or free floating in cytoplasm the ribosomes form

designs - Resorption: simple columnar epithelium of intestine showing microvilli - Resorption: cells of proximal tubule of kidney; the highly active cells with numerous long microvilli, basal invaginations and mitochondria - Glomerulus of kidney, details: capillary loops and podocytes; the barrier between blood and primary urine - Lung: epithelial layer of pneumocytes, basement membrane capillary epithelium and erythrocytes - Collagenous connective tissue: fibroblasts and matrix bundles of banded collagen fibrils - Cartilage: cartilage cells in matrix of cartilage - Bone, osteocytes: long cytoplasmic processes, collagen fibrils and mineralised matrix - Smooth muscle: elongated units showing two kinds of filaments - Skeletal muscle, striated: plasma membrane, sarcoplasm, myofibrils, T-tubules, segments and bands, actin and myosin filaments - Cardiac muscle, striated: segmentation and bands, mitochondria, intercalated discs - Nervous tissue: t.s. of myelinated axons and non-myelinated axons within grooves of Schwann's cells - Nervous tissue: l.s. of axon, neurofilaments, microtubules, vesicles, mitochondria, Schwann's cell with node of Ranvier - Neuro-muscular synapses in skeletal muscle: the junction shows vesicles in presynaptic component and junctional folds that reach the myofibrils in postsynaptic component - Blood: mature erythrocytes including homogeneous mass of haemoglobin, and erythroblast with large nucleus and polyribosomes - Blood: granular leukocytes, eosinophils: lobulated nucleus and disc-shaped cytoplasmic granules - Olfactory epithelium: sensory cells with cilia, mucous cells w. microvilli - Retina: rod cells in longitudinal view; the outer segment and banded rootlet of each cell is a highly specialized cilium - Ovary: details of ovum, zona pellucida and follicular epithelium. - Testicles; spermatogenic epithelium: in longitudinal view an early spermatid and an matured spermatozoon.

Electron Micrographs of Plant Cells and Tissues: Typical plant cells: electron micrograph of low magnification with nucleus, cell walls, vacuoles, mitochondria, dictyosomes, endoplasmic reticulum, plasmodesma and chloroplasts - Meristematic plant cell: representation of the membrane systems - Plant cell: three dimensional reconstruction - Meristematic plant cell: fine structures of organelles; high magnified - Cell of root tip: very high magnified cut-out showing cell wall, plasma membrane, clusters of ribosomes and microtubules - Plasmodesmata: high magnified electron micrograph showing details - Cytokinesis and mitosis in early telophase stage: cell plate formation and phragmoplast - Mesophyll cell: cell walls, large vacuole, chloroplasts, grana of plastids, starch and nucleotids - Mesophyll cell: chloroplast showing starch, grana and thylakoids - Mesophyll cell: chloroplast; highly magnified cut-out with details in grana, thylakoids, and ribosomes in stroma - Cuticle: epidermal cuticle of petiole, cutin layer with residual wax on the surface and primary cell wall - Leaf stoma: section cut parallel to surface of a leaf, with two guard cells and two subsidiary cells - Leaf stoma: transverse sections through stoma cells - Gland cells: section through a gland from leaf of privet showing gland cells and a stalk cell - Root: central cylinder, transverse section showing Casparian strips, endodermis, cortex, gas spaces, pericycle, sieve tubes and tracheids - Root: high magnified section through a Casparian strip - Primary xylem: longitudinal section through a primitive xylem element with secondary, ring-shaped thickenings of the wall - Vascular cambium: t.s. through cambium of a woody stem; low magnification - Vascular cambium, detail: cambial initial cells showing large vacuoles, phragmoplast, proplastids - Primary phloem: l.s. showing living companion cells and almost dead sieve elements with a sieve plate - Fibres: t.s. of fibres with thick layering in the walls - Secondary xylem: Ray cells in longitudinal view and tracheids with bordered pits and half bordered pits in t.s. - Bordered pit: high magnified section; middle lamella, torus, membrane of pit, layers of the wall - Pit membrane and torus: surface relief of torus and microfibrils of cellulose; plastic replica shadowed by subliming metal - Collenchyma: cell of angular collenchyma with thickened corners; intercellular spaces filled with pectins - Stone cell: section with plasmodesmata, primary and secondary cell walls, nucleus, plastids, mitochondria, and endoplasmic reticulum - Raphid cell: cell with innumerable vesicles in cytoplasm, raphidosomes and crystals of calcium oxalate - Sporogenous cells of anther: nuclei of cells with meiotic chromosomes in t.s. and l.s.; synaptic association of homologous chromosomes - Pollen grain: section of a pollen grain showing exine, intine, pollen grain pore, vegetative nucleus and sperm nucleus.



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