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PLANTS GROW AND SEED WITHOUT DAYLIGHT

Plants will flourish without daylight. Although ancient agricultural people worshipped the sun as the all powerful source of life for the grains they raised, Dr. R. B. Harvey of the University of Minnesota has discovered that when artificial illumination is made to entirely supplant the sunlight wheat, oats, barley, rye, potatoes, buckwheat, lettuce, beans, peas, clovers, radishes, flax, and a number of common weeds will grow, ripen, and produce good quality seeds which will germinate.

A speeding up in the growth of the grain is a consequence of this method. Spring wheats were made to produce ripe seed in about ninety days of continuous lighting and at this rate, it is believed, it will now be possible to grow three generations from a cross within one year. Plant breeders and agronomists will find this method of practical use, Dr. Harvey believes.

The energy used by the ordinary greenhouse in Minnesota in the winter time is sufficient to produce all the light and heat necessary for such experiments, it is stated. Nearly all the energy of the light finally becomes heat and thus is made to serve a double purpose.

Dr. Harvey's experiments were performed in three unheated basement rooms and illumination for the experiments was obtained from tungsten filament nitrogen filled lamps which were burned twenty-four hours a day. One set of lamps was found to last long enough to produce an ordinary crop of the cereals.

Government experts found several years ago that artificial illumination might be used as a part time substitute for daylight, but it is now shown that the electric lights may be employed to entirely take the place of the sunlight.

All the plants tested, except cabbage, bloomed and no variety seems to require any particular period of illumination to produce blooming.

READING REFERENCE - Garner, Wightman Wells. and Allard, H. A. Effect of the relative length of day and night on...plants. Washington, Govt. Printing Office, 1922. (Smithsonian Inst. Annual report 1920. p. 569-588.) Shantz, Homer LeRoy. The effect of artificial shading on plant growth in Louisiana. Washington, Govt. Printing Office, 1913. (U. S. Department of Agriculture, Bureau of Plant Industry Bulletin 279.)

HOW THE CHEMIST MOVES THE WORLD

By Dr. Edwin E. Slosson

The chemist provides the motive power of the world, the world of man, not the inanimated globe. Archimedes said he could move the world if he had a long enough lever. The chemist moves the world with molecules. The chemical reactions of the consumption of food and fuel furnish the energy for our muscles and machines. If the chemist can only get control of the electron, he will be in command of unlimited energy. For in this universe of ours power seems to be in inverse ratio to size and the minutest things are mightiest.

When we handle particles smaller than the atom we can get behind the elements and may effect more Marvellous transformations than ever. The smaller the building blocks the greater the variety of buildings that can be constructed. The chemistry of the past was a kind of cooking. The chemistry of the future will be more like astronomy; but it will be a new and more useful sort of astronomy such as an astronomer might employ if he had the power to rearrange the solar system by annexing a new planet from some other system or expediting the condensation of a nebula a thousand times.

The chemist is not merely a manipulator of molecules; he is a manager of mankind. His discoveries and inventions, his economies and creations, often transform the conditions of ordinary life, alter the relations of national power, and shift the currents of thought, but these revolutions are effected so quietly that the chemist does not get the credit for what he accomplishes, and indeed does not usually realize the extent of his sociological influence.

For instance, a great change that has come over the world in recent years and has made conditions so unlike those existing in any previous period that historical precedents have no application to the present problems, is the rapid intercommunication of intelligence. Anything that anybody wants to say can be communicated to anybody who wants to hear it anywhere in all the wide world within a few minutes, or a few days, or at most a few months. In the agencies by which this is accomplished, rapid transit by ship, train or automobile, printing, photography, telegraph, and telephone, wired or wireless, chemistry plays an essential part, although it is so unpretentious a part that it rarely receives recognition. For instance the expansion of literature and the spread of enlightenment, which put an end to the Dark Ages, is ascribed to the invention of movable type by Gutenberg, or somebody else, at the end of the 14th century. But the credit belongs rather to the unknown chemist who invented the process of making paper. The ancient Romans stamped their bricks and lead pipes with type, but printing had to wait more than a thousand years for a supply of paper. Movable type is not the essential feature of printing, for most of the printing done nowadays is not from movable type, but from solid lines or pages. We could if necessary do away with type and press altogether, and use some photographic method of composition and reproduction, but we could not do without paper. The invention of wood-pulp paper has done more for the expansion of literature than did the invention of rag paper 600 years ago.

Print is only an imperfect representation of the sound of speech, a particularly imperfect representation in the case of English because we cannot tell how half the words sound from their spelling. But the phonograph gives^{us} sounds directly, and the audion and the radio have extended the range of a speaker until now a speaker may have an audience covering a continent and including generations yet unborn. What these inventions do for sound, photography has done for the sister sense of light. By means of them man is able to transcend the limitations of time and space. He can make himself seen and heard all round the earth and to all future years.

READING REFERENCE- Baekeland, L.H. Engineer, human and superior direction of power. Science n.s. 54:417-24. Nov. 4, 1921. Hendrick E. Opportunities in chemistry. N.Y. Harpers, 1919.

SAVE COAL BY COOLER ROOMS

The most obvious way to save fuel is not to use so much of it, and you should not. U. S. Public Health Service officials claim that most of our city homes are too hot and that the average healthy adult could get along just as well or better with a house temperature two to ten degrees lower than that usually maintained.

Americans are not such hot-house plants as to require the 72 degrees or more heat frequently found in their offices and apartments. Sixty-eight degrees, it is claimed, is a good temperature for the living room, while it can be kept at 65 without discomfort or ill effect.

Cutting the heat down from 72 to 65 degrees represents a saving of almost a fifth of the fuel bill, Bureau of Mines experts estimate. Some physicians claim that winter coughs and colds are more often due to having the house too warm than to keeping it too cold. The lower temperature would represent a lower doctor's bill in many instances.

Much fuel is wasted in heating rooms not in use. This is especially true of bed-rooms, as health is promoted by sleeping in unheated rooms to which plenty of fresh air has access.

People in France and other European countries apparently enjoy health and comfort, without ever having a fire in their house of the proportions which the extravagant American thinks necessary to his well-being.

NATION NEEDS MAPS FOR WAR AND PEACE

Urging the fundamental importance of the topographical survey of the United States "to several sciences and to a wide range of industrial enterprise as well as to the national defence," the National Research Council has adopted resolutions expressing the hope that the making of governmental maps of the country will be speeded up.

Leading European nations have long had complete maps of this kind, but U. S. Geological Survey officials point out that the United States even lags behind the larger South American republics. Only about a third of this country is at all adequately mapped and that is in scattered sections. It would take 100 years to complete the country's mapping at the present rate.

But it is estimated that the mapping could be completed in twenty years at an expense of \$40,000,000, while it is believed that the people of this country lose more than this amount every year on account of the lack of such data.

Through the use of photographs taken from airplanes, it may be possible to complete the work twenty-five per cent sooner than would otherwise be possible. The use of aerial photographs is still, however, confined to only a part of the work of completing the topographic map and it must be supplemented by work with instruments on the ground. Weather conditions also have a great bearing upon the use of photography as an aid to map making.

The topographical map made by the U. S. Geological Survey, is, however, one of the most useful maps ever devised. It is a relief map which shows the shapes and elevations of land and water features by contour lines, and also shows railroads, highways, and buildings.

Motorists claim that ^{it} is the only perfect touring map. It shows every hill,

valley, stream, bend in the road, every house, and the grade of every slope.

In a few minutes with one of these charts, the road engineer may save days of work and thousands of dollars worth of preliminary investigation. No geologist can determine what is under the surface without a map showing the configuration of the surface on which to plot the outcrops of the subsurface formations.

These maps help the farmer in laying out drainage and in the reclamation of lands from overflow, while the forests cannot be administered intelligently without them.

The advantages for coast and field artillery and for aviation in case of war would be many times the cost of the complete survey which only amounts to the price of a single battleship. Without such maps, a barrage might be rendered ineffective by being thrown too far in advance or might result in casualties to our own troops by falling short.

DOUBT FLORIDA RAILWAY AFFECTS EUROPEAN CLIMATE

Weather experts here doubt that there is any grounds for the fear reported to have been voiced by the director of the Institute of Oceanography at Paris that possible diversion of the Gulf Stream from fills made on the Florida East Coast Railway may cause destructively cold climate in Europe.

Officials of the U. S. weather Bureau and of the Hydrographic Office of the Navy point out that this railroad is not in the main path of the Gulf Stream and that is more than doubtful that any man-made obstructions could seriously effect this mighty ocean current.

Weather Bureau officials are inclined to discredit the claim that the Gulf Stream is the all-important factor in creating European climate. The effect of such currents has been greatly exaggerated, they say. These meteorologists believe that changes in wind pressure and wind drift that interact and react the whole world around produce the climate of the world. The Gulf Stream is a small area compared to the enormous masses of the ocean. Prevailing winds from the west blowing over the vast expanse of ocean water as a whole are believed to produce the mildness of the climate in England, Norway, and other countries in much the same latitude as chilly Labrador on this side of the sea.

Navy men, however, credit the ocean currents with more importance as climate makers. They say that this warm stream heats the air above it and that the winds carry this warmed air across the surrounding waters and thus, in turn, raise the temperature of the waters over which the prevailing winds blow.

Dr. G. W. Littlehales, hydrographic engineer of the U. S. Hydrographic Office, says that there would still be much warming even if there was no Gulf stream, however, for a large amount of warm water is added to this stream by the north equatorial current which travels clockwise through the Atlantic. This current joins the Gulf Stream above the Bahamas, much further north than Key West, the location of the railroad which has been suggested as a menace to climate in England, Norway, and continental countries.

But Dr. Littlehales believes that the Gulf Stream has a profound but indirect effect upon the European climate through its changes in temperature and velocity from day to day. He declared that there are great possibilities of making long range forecasts of weather conditions affecting agricultural crops and fisheries in Norway from observations taken in the Gulf Stream off Florida. Predictions six months or

more in advance are thought possible.

This great Gulf Stream is so large that 2,000 Mississippi rivers would be required to form it. It is so salty that if the 90,000,000,000 tons of water, estimated as the flow of a single hour past a given point, could be evaporated there would be more salt obtained than all the ships in the world could carry.

READING REFERENCE- Helland-Hansen, B. Temperature variations in the North Atlantic ocean and in the atmosphere. Washington, Smithsonian Inst. 1920. Jones, E.L. Influence of the Gulf stream. in Journal of Geography, 16:16-17 Sept. 1917.

GOLFERS FIND FRIEND IN CREEPING BENT GRASS

Golf grass to make the little pellets bound better on the putting green and the fairways has been developed by the Bureau of Plant Industry of the U. S. Agricultural Department in an effort to rescue the links from the seed fakers and so-called experts.

Creeping bent is the grass which has been found to furnish the ideal turf for the devotees of the Scotch game which is beginning to crowd baseball in the affections of our people. The use of this grass has been fought by the seed men because it is not raised from seed.

The ideal golf link covering is a running, jointed grass which sends down roots from each joint, thus forming a thick mat which is resistant to wear and drouth. The method of planting is to cut up these roots in a chopping box and sow them like seed but covered somewhat deeper. In this way, a more uniform color and texture is obtained than from grasses raised from seed which greatly varies in growing quality, resulting in variations in color and texture.

Creeping bent is an importation from Germany with which the Agricultural Department has been experimenting for five years. It is no harder to cultivate than strawberry vines and is raised in somewhat the same way. It is cultivated in rows six feet apart and spreads rapidly. A hundred feet of a row is sufficient to sow an entire golf course. Last year 115 golf courses were supplied in this way and the demand is rapidly increasing.

READING REFERENCE- Kirkby, O. G. Best golf courses in the East. Outing 65:721-6. March, 1915.- U. S. Golf Assn. Bulletin of the Green section. Sept. 1922. Washington, D. C.

DO YOU KNOW THAT

An oil company in Ontario, Canada, has developed a process for separating oil from the tar sands in Alberta and has secured a concession from the Government.

The greatest catch in the memory of the oldest fisherman, 250,000 mackerel, was recently brought into Frederickstad, Norway.

Shears for cutting cloth were invented in Italy about 400 B. C., but it was two or three centuries more before scissors were made by fitting them to the fingers.

NEWS OF THE STARS

October's Stars

By Isabel M. Lewis,
of U.S. Naval Observatory.
(Science Service)

When the first sharp frosts of early October evenings tinge the green of summer foliage with autumn colors, the annual procession of the stars brings back to us the familiar Northern Cross in Cygnus and the Great Square in Pegasus. The bowl of the Big Dipper now rests on the northwestern horizon and the W-shaped group of Cassiopeia has taken its place high in the heavens above the pole.

Brilliant Vega in Lyra, one of the brightest stars of the northern hemisphere, still shines like a diamond in the western sky. Nearby in the southwest may be seen Altair in the constellation of Aquila with its two attendant stars, one on either side. Job's Coffin, formed by a small diamond-shaped group of four faint stars in the constellation of Delphinus, shines a little to the northeast of Altair. Within this small constellation lies the most distant known object in the heavens, a faint globular star cluster visible only in the most powerful telescopes. The light from this cluster, it is estimated, takes about two hundred and twenty thousand years to travel to the earth with a speed of 186,000 miles per second.

The Milky Way now stretches diagonally across the heavens from the northeast to the southwest, a broad, luminous belt studded with countless faint stars. Directly in its path and almost in the zenith in our latitudes at this time of year lies the Northern Cross in Cygnus. At this point there is a dark rift in the Milky Way that separates it into two distinct branches which do not unite again until they have reached a point below the southwestern horizon. The first-magnitude star Deneb, or Alpha Cygni, marks the top of the Northern Cross and the beautiful blue and gold double star, Albireo, its foot. Viewed telescopically this is one of the most beautiful regions of the Milky Way.

The Great Square in Pegasus lies close to the meridian at this time and a little to the southeast of the Northern Cross. The star in the northeastern corner of the Great Square belongs to the constellation of Andromeda which is outlined by three bright stars nearly in a straight line stretching from this point toward the northeast. Just beyond, in the path of the Milky Way, lies the constellation of Perseus now close to the northeastern horizon. According to mythology, Pegasus was the Winged Horse that bore Perseus to the rescue of the maiden Andromeda who had been chained to the rocks to be devoured by the sea-monster Cetus, now coming into view above the eastern horizon.

In the southern part of the heavens at this time of year may be seen the brilliant and beautiful Fomalhaut in Piscis Australis, the constellation of the Southern Fish. Standing alone in a solitary position, far removed from the bright stars and conspicuous groups farther north, this star with the strange name appears as a visitor from a strange land, the Southland, where the heavens are studded with many strange groups our eyes have never seen.

California fruit growers are saving peach seed for fuel this winter.

Burns caused twenty-two deaths a day, a total of 8,088 in this country last year.

The world's total production of asbestos in 1921 was the smallest since 1914.

SHELL-SHOCK NOT ALWAYS DUE TO SHELLS

About eighty per cent of the so-called shell-shock cases in the late war were not produced by shells. This fact is brought out in the recent report of the British Army Council Committee which has been studying this problem since August, 1920. They also find that any type of person may suffer from this form of nervous trouble if exposed to the conditions of modern warfare long enough.

Emotional shell-shock or hysteria was common in soldiers on home service and often developed after weeks of absence from the scenes of fighting. Mental or physical exhaustion of a cumulative nature followed by some emotional disturbance was found to be the cause for such cases. Noise, loss of sleep, fatigue, discomfort, insufficient food, immoderate use of alcohol, infectious diseases, the pain of wounds and sores, and poison gases were among the conditions found to have produced exhaustion. In most cases of emotional shell-shock there is a personal or family history giving evidence of nervous instability. It has been found difficult or impossible in certain cases to distinguish between emotional shell-shock and cowardice.

The absence of this emotional instability is the chief distinguishing symptom of the true shell-shock which actually results from a shell explosion. Postmortem microscopic examinations of men killed by air percussion of shell detonation showed ruptures of small blood vessels of the brain invisible to the naked eye, although the victims were seemingly uninjured. No human being, however constituted or trained, it is claimed, can resist the direct effect of the bursting of high explosive shells.

IRON RUSTS AWAY INSIDE EYE BALL

A small piece of iron or steel may become imbedded in a human eye, rust completely away, and the impaired vision be restored to normality. Lieut. Colonel Harry S. Gradle, Medical Section, Officers' Reserve Corps, has reported to the Association of Military Surgeons of the United States a rare case which seems to confirm this idea.

In most instances foreign bodies imbedded in the lens for a long time produce continued irritation or cataract formation. In the case cited, a man superintending wire drawing in a steel mill felt something fly into his left eye. He experienced little trouble until nearly a month later his vision became blurred. A tiny foreign body was located by X-ray. A few months later the lens tissue became slightly discolored brown. An incision was made in the eye but from the matter removed the magnet was unable to find the foreign body that was so clearly visible a few months after the injury.

Dr. Gradle thinks that the foreign body became completely oxidized within the lens before the operation and that the brown coloring of the tissue was caused by iron rust.

A Russian locomotive was recently assembled from standardized parts machined in twenty different German shops with no more difficulty than a locomotive built complete in one shop.

If the ocean were fresh water, all the harbors of New England and the Middle Atlantic States would be icebound by winters as cold as we now have.

Over twice as many men as women died accidentally in 1920.

AMATEURS RADIO TO PORTO RICO

For the first time in the history of amateur radio activities, communication has been established between amateurs in Porto Rico and this country. Messages have been exchanged between the Porto Rico Radio Club and the American Radio Relay League at Hartford, Conn., with which the Porto Rico club is affiliated.

The first message from the island to the mainland was relayed from San Juan, Porto Rico, to 4FT Atlanta, Ga., thence to 4BX at Wilmington, N.C., and finally to 1QP, J. L. Reinartz, South Manchester, Conn.

A return message was transmitted from Hartford to San Juan in the record time of one hour and 27 minutes.

League members are being instructed to accept messages for Porto Rico beginning at once, as regular communication will be maintained whenever the weather permits.

Hiram Percy Maxim, president of the American Radio Relay League, is highly enthusiastic over the achievement and said that in his opinion it marks the advance of the radio amateur toward the southern hemisphere. He believes that before long Porto Rico amateurs will be communicating with amateurs in Central America and Brazil, and when this comes about there is every reason to believe that communication via the American Radio Relay League will be established with English speaking peoples in South Africa.

TANK IN KITCHEN STEALS TON OF COAL

Uninsulated hot water tanks in homes in the United States average a waste of one ton of coal a year, or its equivalent in other fuel, according to a statement made today by T. F. Manville, president of Johns-Manville, Inc., in connection with efforts being made to conserve the householder's supply of fuel.

"It is a fact pretty generally known", he said, "that steam, hot water, and hot air pipes should be insulated to get the fullest efficiency from fuel, but a great many people overlook the inoffensive little hot water tank in one corner of the kitchen or cellar.

"Such a tank as is used in the average home, filled with hot water and not covered by asbestos or other equally efficient insulating material, will give off by radiation in one year an amount of heat which is equivalent to over a ton of coal. Four-fifths of this loss is easily preventable."

GLACIERS AID AND HINDER PROSPECTOR'S WORK

Glaciers both help and hinder the miner, says Dr. Milnor Roberts, dean of the Washington School of Mines.

The great ice rivers of the past have laid bare rich deposits of ore in passing over mountains. The mines of British Columbia offer many instances of ores formed at lower depths, but now appearing unweathered at the surface. Their change of relative position has been brought about through erosion and a final sweep by the ice. But while the glacier has in the ages gone laid bare the riches of the mountain, just as one might cut away half an apple and expose the seeds to view, the surviving glaciers of today do not always help the prospector. A prospector near Doubtful Lake used to dig through glacial ice for some distance before striking his vein in the solid rock. By next season his tunnel through the ice had moved down the valley a little distance and he had to drive another one. He soon had several useless blind entrances lined up in a row.

READING REFERENCE- Russell, Israel C. Glaciers of North America. Boston, Ginn & Co., 1897.

GOOD ROADS SAVE HALF OF TRUCK POWER

"The highway is an investment, and the measure of accomplishment is not the building of mileage but the resulting reduction in the costs of transportation," says Dr. W. K. Hatt, director of the advisory board of highway research of the National Research Council which is cooperating with the U. S. Bureau of Public Roads and the Quartermaster Corps of the Army in an investigation which it is expected may lead to great economies in road construction, motor operation, and car design.

"We have in the past confined our attention too closely to the materials of construction. Now, we are alive to the need of fitting the road to the traffic. The large expense of highway transportation is in the expense of operation rather than in fixed charges and maintenance of road. Twelve dollars are spent on the vehicle where one dollar is spent on the road. There is room for research on the vehicle if we are to cut down the transport bill," he emphasized.

"Our investigation has already shown us," he continues, "that there is more than twice as much power required of the engine when a truck is traveling over one of the lower types of road surfacing than when moving over one of the higher types.

"It is also probable that great economies might be effected in the design of motor cars were road grades reduced.

"In less than a year, our present investigation will be completed to cover tests with various types of motor vehicles with the load, tire, and spring equipment moving at different speeds over varying kinds of road surfaces. The amount of gasoline used, the resistance of the road, wind resistance, and internal engine resistance will be covered in the data being collected. This information will enable the highway engineer to determine what type of surface to use for a given volume of traffic to result in the least total cost for road and vehicle operation."

The board of which Dr. Hatt is director is coordinating highway research work throughout the country and putting workers in touch with one another so as to save delay and cost of investigation when completed investigations are available from another organization.

MAY MAKE MILK FROM SAWDUST

Most folks might think sawdust proper food for the little wooden cows in baby's toy Noah's Ark, but the Wisconsin Agricultural Experiment Station finds that real high-producing dairy cows give just as much milk when hydrolyzed sawdust forms a third of the feed mixture.

"Two lots of three cows each were fed for seventy days. One lot received an excellent ration of alfalfa, hay, corn silage, and a concentrated mixture made up of 60 parts yellow corn, 20 parts linseed meal," says a recent report. "The ration for the other lot was the same except hydrolyzed sawdust made from western white pine was gradually substituted for ground corn at the rate of two pounds of sawdust for one pound of corn. When the percentage of sawdust in the concentrate mixture had reached 40 per cent, two cows failed to eat the mixture well and the proportion of hydrolyzed sawdust was reduced to one-third and no difficulty was experienced in getting the cows to eat this mixture." The cows maintained the live weight slightly better on the hydrolyzed sawdust while the milk and fat production on the two rations was practically the same. Inasmuch as in certain districts of the country, especially in the far West, carbohydrate-rich feeds are commonly high in price, the conversion of sawdust into a stock food may perhaps be of economic importance.

READING REFERENCE- Morrison, F.B. Hydrolyzed sawdust for dairy cows. Australian Forestry Jour. 5:97-8. April, 1922. Sawdust, chemically treated, feed. Jersey Bulletin and Dairy World 39:1940 July, 21, 1920. -----

TABLOID BOOK REVIEWS

"The New Heavens". George Ellery Hale, director of the Mount Wilson Observatory of the Carnegie Institution of Washington. Charles Scribner's Sons.

A little book by a master hand explaining the new methods which have given us more knowledge of the constitution of the stars than all previous centuries have found out. Written for the person who tries to count the stars on a clear and moonless night for the mere pleasure of feeling unimportant.

PLANTS FIGHT FOR LIFE BEGINS BEFORE BIRTH

That the fight for life with the survival of the most fit, which Darwin held began with the birth of an animal or the germination of a seed in the ground, starts much earlier in vascular plants with a struggle between minute or embryonic individuals entirely within the parent growth is clearly proved by experiments, according to Dr. John T. Buchholz, professor of botany, University of Arkansas.

The Darwinian theory of natural selection holds that when seeds germinate or when vegetative organs such as roots give rise to new individuals or when animals are born they enter the ring of life for a battle royal against physical environment, against other species, and against their own fellows. That a selection may occur during the earliest developmental stages of the individual, during the process of seed development, has been generally neglected in the literature of organic evolution, claims Dr. Buchholz, although many of the important facts have been known to science for nearly a century.

What he calls "developmental selection" represents a competition between the individual embryos, pollen tubes, eggs, etc., which expresses itself in the reproductive cycle of practically all vascular plants and is a factor to be reckoned with among animals as well.

In such conifers as the spruce, for example, there are several embryos that engage in an intense life and death competition during their development. Only one embryo reaches its full term of growth to become the seed. This process is more truly selection than the so-called natural selection as conditions inside the plant are more uniform than those found in the complex external environment in which chance plays so large a part.

Developmental selection should not be confused with older theories. It is easily demonstrable and occurs between definite individuals which may be of the one cell or the many cell kind.

Flaming jets or prominences have been observed arising from the sun to a height equal to eight times the diameter of the earth.

More rifles are ruined by improper preparation for storage than by any other cause, ordnance experts of the U. S. Army state.

Great damage is done to book covers by the action of mold and insects in the Philippines.
