der Wulp (Tijdschr. entom., XXXIV, 1891, p. 216) von der *Drosophila nigropunctata* n. sp. aus Java gibt, ganz gut der *Dr. repleta* entspricht; und damit ist die Synonymie und Verbreitung der Species vermehrt. Die Art habe ich auch in Mailand gefunden; Dr. Speiser hat die Art auch in Luino am Lago Maggiore gefunden; und Dr. Villeneuve schreibt mir, daß er dieselbe von der Insel Réunion erhalten hat.

Ferner erhielt ich in diesem Jahre dieselbe Art von Herrn Terry von Honolulu auf den Hawaiischen Inseln! Unter den vielen Drosophilen der Fauna Hawaiiensis von Grimshaw ist die Art zum Glücke nicht enthalten, sonst wären wir vielleicht einem neuen Synonymon begegnet.

Herr Terry hat dort die Art aus menschlichen Exkrementen gezogen. Das Puparium zeigt sehr lange Vorderstigmen, welche am Ende mit 10—12 langen, sternartig geordneten Fortsätzen bewimpert sind.

Synonymie und Verbreitung dieser niedlichen Art sind also wie folgt zu geben.

Drosophila repleta Wollaston 1858 (*punctulata* Loew 1862, *adspersa* Mik 1886, *nigropunctata* Wulp 1891, *marmoria* Hutton 1900).

Europa: Oesterreich, Wien (Mik, Pokorny); Italien, Mailand, Turin (Bezzi), Luino (Speiser); Spanien, Algeciras, Escorial (Czerny, Strobl).

Afrika: Madeira (Wollaston); Teneriffe (Becker!); Aschanti, Westafrika (Mik); Réunion (Villeneuve).

Asien: Java (Van der Wulp).

Neu-Seeland: Auckland (Suter!, Hutton).

Hawaiische Inseln: Honolulu (Terry!).

Nordamerika: Florida (Johnson).

Zentralamerika: Kuba (Loew); Saint Vincent (Williston).

Südamerika: von nicht bestimmtem Orte (Bezzi!)

57: 16. 5

Insects destructive to Books.[1])

By *William R. Reinick.*
Chief of the Department of Public Documents,
The Free Library of Philadelphia.

Through and through the inspired leaves,
Ye maggots, make your windings;
But oh! respect his lordship's taste,
And spare his golden bindings.
Robert Burns.

I have been investigating the subject, „insects that destroy books", for a number of years; and this paper is simply a summary of a few of the facts that I have discovered and collected. No attempt has been made to make it complete, either as to species of insects, or subject matter under any particular group. These, in a complete form, with the results of the further experiments now being made to prove the theory advanced, will be published later.

Various insects have been named as the true bookworm. The insect known as the cigarette beetle, *Sitodrepa panicea*, is given as the true bookworm by Prof. L. O. Howard, United States Entomologist; but if the name of „bookworm" is given to the insect which causes the greatest destruction, then this species will have to be placed quite a distance down in the list. Personally, I will not try at the present time to settle the question as to the species which is to be given this doubtful honor.

That a knowledge of the fact that books are destroyed by insects is not of recent acquisition may be gathered from the writings of the ancients.

The earliest reference, according to Austen[1]), was rescued from oblivion by the lad Salmasius, in 1606, when he discovered the manuscripts of the anthology of Cephalus, in the libraries of the Counts Palatine, at Heidelberg. Among the fragments in this collection is one attributed to Evenus, the sophist-poet of Paros, who wrote about 450 B.C.

Aristotle speaks of a „little scorpion-like creature found in books", which was evidently a species of *Acarina* or pseudoscorpions. Horace and Ovid also speak of the bookworm. Pliny, in his „Natural History", has very little to say upon the subject. Martial, who lived in the first, and Lucian, in the second century, A.D., speak of the bookworm, and many other writers mention them; but it was not until 1665, when Hook in his „Micographia", published an account and gave an illustration of the insect, that entomologists were enabled to determine with any accuracy the insect that was named as the cause of the destruction of books. It is impossible from Hook's description to tell what species was meant; but the illustration accompanying the description shows that it must have been a species of *Thysanura* or *Collembola*, commonly known as the silver-fish and spring-tails.

It has been stated that more books and papers are destroyed by small forms of life in one year than by fire and water combined; and, from the facts given by various writers, and the statements made to me in letters by many librarians and others, especially where the libraries are located in the warmer regions, I am positive that this statement is true. Those in charge of collections in the temperate regions, whose volumes are not as rapidly destroyed, are apt to doubt the enormous destruction of books each year by practically unseen life.

Again, that this destruction is great enough to cause alarm, is indicated by the number of prizes offered by various bodies for means to prevent this never-ceasing destruction. Prizes were offered by the „Royal Society at Göttingen in 1774, the „International Library Congress" in 1903, etc., but as yet no satisfactory results have been obtained. I hope before long to be able to present to the world the cause of these ravages and a means of preventing them.

Those who have read articles upon the destruction of books and papers by insects must have noticed that in almost all the papers the author has simply stated that the insects were after the paste used in the binding; and most of the prizes that have been offered

[1]) Reprinted from American Journal of Pharmacy 1910.

[1]) Bookworms in fact and fancy. *Popular Science Monthly*, 1899, vol. 55.

from time to time have the same object in view. If the paste is the object of attack, why is it that photographs, which are fastened to the cardboard by means of paste, are not eaten?

Although some of these writers have stated that the bindings were bored or gnawed, a gallery leading from an opening made on the outside towards the interior of the book; that the glazed surface of the paper was eaten off; that in a few cases that portion of the page which had received the impress of the printer's ink only had been eaten, making the page look as though the letters had been cut out with a punch; and again, that a cavity had been found in the interior of the book, without showing by what means the insect was able to obtain access: not one of them, as far as I have been able to find, has reasoned upon the question that there might be other causes for these ravages of the insects upon books besides the hackneyed phrase, „that they are after the paste used in the binding, in order to obtain the starch contained in it".

Having read hundreds of articles and notes upon this subject, and having had the pleasure, from my standpoint—but not that of the librarian, of examining many hundreds of volumes of ancient and recent date of publication, with bindings made of different leathers, paper made of rag, wood, and other materials, my attention was before long attracted by the fact, that in the great majority of books examined no attempt was made by the insects to eat the paste used in the binding, and also by the many cases in which a cavity or cavities were found in the interior of the volume without showing the means by which the insects obtained access thereto.

Looking at the various ways in which books were ravaged, and knowing from my own studies and observations in entomology that the insects have wonderful instinctive powers, which in a number of cases could very easely be classed as intelligence, I have come to the conclusion that there must be other reasons besides the desire for paste, to cause these various depredations, and I have asked myself this question: „As we know that the dog and cat, when sick, look for certain herbs, grasses, and putrid animal matter, being directed by their instinct to that substance which contains the vegetable and mineral matter which is best suited for the particular ailment from which they are suffering at that particular time, may not the insect, with an instinct as great if not greater, have use for them for the same purpose?" It seems to me, that the lower we go in the scale of life, according to the classification of the systematists, the more wonderful are the instinctive faculties of the small forms of life, and that if a classification was made according to instinctive faculties, it is a question whether the ants would not outrank the animals by many degrees.

The new school of medicine, in departing from the system of the old, that is, that in which Hahnemann in following Paracelsus claimed that certain symptoms in human beings required mineral agencies and vegetable compounds in potencies equivalent to the complaint, neglected to study the power of drugs, and results not anticipated frequently occur, caused by not using judgment in the quantity of the dose given. Those interested in finding means for destroying life that is destructive, should use the means as those advocated by Hahnemann in their researches.

Starting upon this theory which I contend will be found to be true, when biologists, physicists and entomologists have searched more deeply into the evolution of the lower forms of life, I divided the books into classes according to that portion which was damaged, and will describe some of the most important and name a few of the insects which attack that particular group.

P a s t e E a t e r s. — Science has proved beyond doubt or question that there can be no destruction of matter, only a change of form. If there is no destruction of matter, then we have a demonstration of the theory of the worm of larva having been attracted to the paste used in the binding of the books. In the agricultural kingdom we find that rye, wheat, and the various other varieties of grain are constantly being damaged by the work of different species of insects. These insects and other small life upon the exudations of plant life, and the human body is also giving off exudations in the form of perspiration which is also a source of nourishment to many forms of life.

We will take rye and wheat, which are principally used in paste making, as an example. The whole grain is taken to the mill, husked and ground, and prepared by various processes for the sustenance of the human family. After all the processes of the miller have been completed, it is barrelled or bagged and is ready for distribution. In the processes we find that alum has been and is still being used as a whitening agency for the different grains. The flour is taken into the factory apparently pure, clean, and free from all forms of animated life; but in a very short time, especially if it is kept in a compartment that is heated, or in a moist atmosphere, and is left standing some time before being used, life is apparently created in it, a puzzle to all, as to its origin and nature, and stranger still, the first life noticed is always worm life. In this case it is known as the „flour-worm". Mr. James Stone, a flour merchant of Philadelphia, in reply to my questions, stated that they always discovered the worms first, that they were only found in the centre of the barrel, never near the sides, and that the loose flour laying around the floors, of which there always was a quantity, was never found to have worms in it. The lower or coarser grades which are used exclusively for paste were first damaged. The finer grades were more seldom found to be affected. This goes to prove my theory that the life was in the flour before grinding, and that it lay dormant until the proper conditions were produced, such as heat and dampness. The grinding of these grains allows the gases in the air to reach the particles which, to a large extent, were before protected by skin or husk. These gases cause a chemical change to take place, which has been little studied, and this will be found to give food for forms which were heretofore in a dormant condition. Many eggs of the smaller forms of life can hardly be seen, even with a compound microscope. The following are some

of the species that may be classed as paste eaters: *Pyralis farinalis*, a moth, and *Tenebroides mauritanicus*, *Silvanus surinamensis*, *Calandra granaria*, and *Tenebrio molitor*, all beetles.

Paper. — Paper is made from cotton, linen, hemp, rags, and waste, from chemically prepared woods, from straws, from bark without the wood, from wood not chemically prepared, and many other substances. In a great many papers, clay and other minerals are added as fillers. While we are conversant with the various processes used by paper manufacturers, yet very little attention has been given to the real character of life that dwells within the manufactured product in its primoid state. Cotton fly is used for low paper stock, and the little insect that infests the cotton boll, known as the cotton weevil, sends forth its offspring under a different form, yet with all the instincts of itself.

After the paper has passed through certain stages, but not with sufficient intensified heat to destroy the principle of existence, the species evolutionizes into another state or mode of living. In the broader conception of biological truths, ready answers are given to this profound questions, *i. e.*, the origin of various forms of life, and the researcher has ready for the querist the proper foundation whereon to build the superstructure of that truth which the arcanum of nature reveals to the desires of the mind of the scientist and physicist. Too little attention has been given to the manuscript notes of scientific workers, often only a line or two of their observations upon the small forms of life. The average scientist thinking it too trivial to notice, often passes over the very observation, which is the key to the puzzle that he has been spending years in trying to solve.

Paper Eaters; Wood Pulp. — A species of insect, frequently found in libraries, is the *Cimex lectularius*, vulgarly known as the „chinch" or „bed-bug". Its natural instinct leads it to wood on account of certain poisons in the forms of acids contained therein, and certain nourishments which are of a poisonous character to the human being, but beneficial and necessary to insects and worm life. Where paper has been manufactured from wood pulp, containing the particular acids or poisons which the „bed-bug" requires, there you will find the insect with all its instinctive faculties. Why do they live and thrive under wall paper? Many wall papers, some of which are known to be a cause of illness to mankind, have large quantities of arsenic, cochineal, and paris green in them. This mineral compound, being changed by the continual variation of temperature going on in the room, is sufficient to change the natural character of the paper, and also the habits of the bugs, who are thus able to obtain nourishment from the back of the paper.

Among this group may be found the following beetles: *Apate capucina*, *Xestobium tessellatum*, and *Lyctus unipunctatus*.

Paper Eaters; Vegetable Fibres. — In the Aztecan history many of the primitive documents were made from banana skin. These were made to receive the imprint, just the same as paper is manufactured for printing to-day. A sample of this paper was placed in a perfectly sealed case, and a scholar wishing to refer to it one day, upon going to the case containing the writing, was astonished to find that all the paper had been entirely destroyed, although the case was still impervious to any attack made from the outside. This demonstrates how long life may be prolonged, in the sense of the insects being placed away from their natural surroundings, continuing the life cycle whenever the proper conditions are given.

Trichophaga tapetzella, *Tinea pellionella*, *Tineola biselliella*, and *Plodia interpunctella* are a few of the moths that bore into paper in order to obtain access to the fibres.

Paper Eaters; Mineral Fillers. — This group includes papers where quantities of clay and other mineral substances have been used as fillers. For an illustration we will take the character and life habits of the *Termites*, or white ants, which are in a measure destructful to material utilized in the manufacture of paper. The alluvial deposits are natural to the white ant, consequently, when clay is used in the manufacture of paper, the instinct in the ant leads it to feed upon that which is natural to it, especially if the books have been kept in a place where it is damp. The lower organic life is, but in a measure, an evolution that is manifested in the higher and more complex forms of life. In the mountainous region of North Carolina is found a collection of people who eat large quantities of clay which is found there in abundance. These creatures, the whites being disignated as „poor white trash", and the negroes as the „blue-gummed negroes", are addicted to the habit of clay eating, and nearly all are veritable living skeletons. The eyes and gums of the whites have a reddish hue, and their skins become a dirty yellow; and the gums and skins of the negroes take on a bluish hue. This clay contains arsenic, and, instead of clay eaters, they might more properly be called arsenic eaters. The supply of clay for daily use is provided with more energy and precision than food. This clay poisons the saliva exuding from the glands of the mouth, and also from the base of the teeth, and makes their bite probably poisonous.

And so we see the special laws of nature by which forms of low life live, actuated by the first principles of their instinct to return to their primitive mode of feeding; that is, the life that is generated from the botanical kingdom, much in sympathy with the facts established by Dr. Hahnemann, which verifies the principle that like attracts like.

Monorium pharonis, or red ants, *Termites*, or white ants, are found destroying paper that has clay in its composition. The first named is also fond of saccharine that is found in wood fibre.

Paper Eaters; Animal Fibre, Parchment. — Insects, such as roaches, which destroy parchment, are after the oils and fats which are used in their preparation; for however carefully the parchment may be prepared, there is always a certain amount of oil and grease left in it. These oils are obtained from the plants, minerals, and animals of the earth, which the roaches have always been used to;

therefore, when placed in a location away from their natural food supply, their instinct compels them to seek those books which have the foods, etc., in their composition to which the roaches formerly had access. After the processes of the manufacture of the paper have been completed and it is ready for the printer, another transitional change is nigh, due to the chemicalization of the inks that are used.

Parchment is especially eaten by the roaches, *Periplaneta americana*, and *Ectobia germanica*, the criekets, *Gryllus assimilis*, and some species of *Coleoptera*, or beetles.

Skin Bindings. — Bindings made of skin always have a certain amount of oily or gelatinous substances in them, even though they may seem perfectly dry to the observer, and these bindings are subject to the ravages of the insects in their natural state go after substances containing oils and greases. Leather that is perfect in its external appearance, under degrees of dampness will expand, and under degrees of heat will contract. The oil is hidden at the bottom, and does not come to the surface until pressed out by expansion caused by dampness. The skins contain the same elements in the dead state as in the living, and the bindings will be attacked by the same forms of life that lived upon the live animals, because they can still find the mineral poisons and the alluvial substances that were part of their natural food supply. Leather bindings are also subject to the depredations of insects and worms which are partly after the oils, acids, and fats which are in the skin, as well as from the new life that has been conveyed to it by the uncleanliness in preparing the leather, not including the hundreds of substances, many of them poisons, especially tannic acid, used by the tanners for tanning purposes, which are also attractive to other species of insects. And just as the animals which eat the plants containing various chemical elements thus become impregnated with acids, so will the insects living upon animals and plants be found to have acids in their compositions. (to be contined.)

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57. 99 (6)

Neue und wenig bekannte afrikanische Bienen der Gattungen *Eriades, Steganomus und Prosopis.*

Von *Embrik Strand*,
(Berlin, Kgl. Zoolog. Museum).

Eriades namanus Strand n. sp.

Ein ♂ von: Klein Namaland, Steinkopf (L. Schultze).

Charakteristisch u. a. durch das Fehlen von Scutellumhöcker, die lange abstehende Behaarung, das Fehlen einer deutlichen Querleiste auf dem 1. Segment usw. Ist überhaupt kein typischer *Eriades*; ich möchte das Tier jedoch bei dieser Gattung lassen und auch Friese hat das Exemplar als *Eriades* etikettiert.

Färbung schwarz, die Tarsen am Ende schwach gebräunt. Die Behaarung des Clypeus ist schneeweiß, schwach silbrig schimmernd, die übrige Behaarung hellgrau, am Hinterrande des 1. Segments jederseits ein weißer Querhaarfleck, auch auf dem 2. Segmenthinterrande ist eine weiße Haarbinde jederseits angedeutet, aber verwischt. Flügel subhyalin, im Saumfelde und in der Radialzelle schwach getrübt, überall iridiszierend. Behaarung der Tarsen blaßgelblich.

Kopf dick und gewölbt, von vorn gesehen etwa kreisförmig; der gewölbte Scheitel glatt und glänzend, mit ziemlich tiefen, aber unter sich um ihren einfachen bis mehrfachen Durchmesser entfernten Punktgrübchen. Ozellen eine so stark gekrümmte Reihe bildend, daß eine die hinteren vorn tangierende Gerade die vordere Ozelle kaum berühren würde; unter sich sind sie um ihren Durchmesser oder reichlich so weit entfernt. — Mesonotum glatt, glänzend, mit tiefen, aber unter sich um ihren einfachen bis mehrfachen Durchmesser entfernten Punktgruben, ohne irgendwelche eingedrückte Längslinien. Scutellum wie Mesonotum, jedoch die Punkte seichter und diejenigen hinten mitten in die Länge gezogen. — Metanotum an der Basis eine schmale, fein längsgerunzelte Querbinde bildend, dahinter eine glatte, stark glänzende Partie; unter dieser ist der Stutz mit einer tiefen Mittelgrube und deutlicher Punktierung versehen.

Abdomen wie Mesonotum, jedoch dichter punktiert; die Segmente 1—2 der Länge nach stark gewölbt, bezw. an beiden Rändern stark eingeschnürt, das erste Segment an der Basis tief schüsselförmig ausgehöhlt und diese Aushöhlung ist glatt und stark glänzend. Das 6. Segment liegt an der Bauchseite und ist mit hoher, glatter, glänzender, ganzrandiger Randleiste versehen. Das 7. Segment wenig vorstehend. Baueh ziemlich dicht, seidenartig schimmernd behaart.

Geäder. Basalader schwach gebogen. Die beiden rekurrenten Adern sind von den Ecken der 2. Cubitalzelle gleich weit entfernt; die Vorderseite dieser Zelle ist ein wenig länger als die proximale, aber erheblich kürzer als die hintere Seite der Zelle. Die erste Cubitalquerader ist vom Flügelmal weniger als von der zweiten Cubitalquerader entfernt.

Körperlänge 6 mm. Flügellänge 4,5 mm.

Eriades capicola Strand n. sp.

Ein ♀ von Kapland.

War von Friese als „*Eriades ? Freygessneri* Schlett." etikettiert, kann aber nicht diese Art sein, u. a. weil Scutellumhöcker fehlen. Außerdem weicht das Exemplar von der Beschreibung von *Freygessneri* durch folgendes ab: der Vorderrand des Clypeus nicht „subtiliter crenulato", sondern vorn mitten ganz seicht ausgerandet und beiderseits dieser Ausrandung mit einem kleinen Zahn versehen, weiter seitwärts findet sich ein stumpfer Zahnhöcker; der Rand des Clypeus ist in der Nähe dieses Höckers glatt und etwas glänzend; ganz kleine, unregelmäßige Erhabenheiten finden sich sonst hier und da am Clypeusrande. Mandibeln breit, flach, mit kräftigen und wenig regel-