



FRASS

INSECT REARING NEWSLETTER

Volume 18, number 2 (1995)

Welcome again to the **FRASS Insect Rearing Newsletter**, a forum for anyone interested in, involved in, or in any way associated with insect rearing. Norm Leppa challenges editors to produce two issues per year, and I will do my best to hold to that schedule. New issues mean new submissions; and you have been sending some good material for inclusion. So, keep up those submissions, and we will continue to see a good **FRASS**.

Please feel free to call, write, fax, or E-mail items you wish to have included. Reach me at:

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Rhone-Poulenc Ag Company
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The editor reserves the right to edit any submission, but will try to meet everyone's needs with information sent to **FRASS**.

Norm Leppa sent the following thoughts on **FRASS**:
*"The idea of using the name, "FRASS," came from a side meeting at a 1974 conference in Gainesville, Florida on the genetics of insect behavior. As I recall, Ray Patana suggested the name without any connection to the Lepidopterist Society. We were just sitting around at the Holiday Inn one evening brainstorming ways to improve communication among insect rearing facilities. I could document the details and confirm the date for a future issue of **FRASS**, if anyone would be interested (Yes, we would!)."*

"I have been proposing a symposium on mass rearing of arthropods for the XX International Congress of Entomology ever since the last congress at Beijing. Walde Klassan was one of the organizers when he was located in Vienna, Austria and, at his request, I submitted a proposal for the symposium. I do not know if the symposium has been approved."

Editor's note: If anyone has further information, send it to **FRASS** and I will pass it along.

REARING COCKROACHES

Cockroaches have been and are being used in a variety of bioassays. The senior editor of *Cockroaches as models for Neurobiology: Applications in Biomedical Research*, Ivan Huber, suggested that FRASS might wish to reprint the chapter on cockroach rearing, given the recent increased interest in cockroaches as test animals. I agreed, and have included below a condensed version of that chapter. For further information, I refer you to *Cockroach Culturing*, David W. Alsop, in *Cockroaches as Models for Neurobiology: Applications in Biomedical Research*, eds. Ivan Huber, Edward P. Masler, and B. R. Rao.

COCKROACH CULTURING

Ideally, cockroaches should be cultured in a sealed constant-temperature incubator with light and humidity controls and containing both a sink and a work table. Air exhaust should be actively removed from the room. Open-back metal racks, preferably of stainless steel, are best for holding rearing containers, and should provide 2 to 3 inches of space above and between containers for best air circulation.

The great majority of cockroaches are subtropical or tropical in origin and therefore

are best raised at temperatures of $26 \pm 2^\circ\text{C}$., 40 to 60% relative humidity, and day lengths of 12 hr. light/ 12 hr. darkness.

In general, cockroaches require large amounts of water to prevent death by dessication. Maintaining 40 to 60% relative humidity requires that humidification be provided in the winter and dehumidification in the summer. At 40% relative humidity, waterers dry out rapidly and the nymphs of many species die of dessication. On the other hand, while most species do very well and actually prefer >60% relative humidity, two problems become dominant at higher humidities. First, the acaroid mites associated with virtually all species can rapidly build to numbers great enough to annihilate a culture at higher humidities; and mold growth on food, waterers, harborage materials, and carcasses becomes rampant at high humidities.

All species do well on a 12 hr. light/ 12 hr. dark cycle. The vast majority of species are most active at night, and a light-dark cycle is necessary to entrain their many circadian rhythms. Considerable variation in light intensity is permissible, and it can be held at a comfortable level for the investigator if the cages are provided with enough harborage material so that the cockroaches can hide when they wish.

The best food for raising cockroaches is dried (pelleted)

dog food. For most species this is all that need be provided. It is one of the most completely fortified of all animal feeds, and many species eat it entirely, while others (particularly blattellids) honeycomb it in a variety of patterns, an indication that they apparently do not require or are avoiding certain of its components. On the other hand, most species do not grow well on any of the many laboratory chows (rabbit, mouse, rat) presumably because these are apparently lacking one or more substances required for their optimal growth. Also, while most species are detritivores that will eat almost anything when hungry, it does not necessarily mean that they will grow well on whatever is presented to them or that it is necessary to provide them with a variety of different foods.

A few species, all live-bearing blaberids, seemingly do better when additionally provided with certain fruit supplements (banana peels and melon rinds) and/or brewer's yeast. The lack of knowledge (regarding the matter of additional supplementation) is one of the reasons that certain species have never been cultured successfully.

All cockroaches require water provided *ad lib*. While nearly all of them can survive for relatively long periods without food, virtually none can do so without being given fairly

constant access to water. Since the majority of time spent in caring for cultures is devoted to watering the insects, a major aim has been to develop low-cost, high-capacity waterers that are easy to prepare, are of long-term usage, and which prevent water from spilling or siphoning into the cage.

Because of the great variety of cage sizes, two general types of long-term waterers have been developed for culturing: horizontal ones for smaller cages and vertical ones for the larger cages. (Both kinds of waterers are covered in great detail in the chapter, so refer to the book if you need specifics).

The type and size of the cage chosen to house a particular species are dependent on the size of the individuals, their initial numbers, their spacing requirements, whether they prefer to rest on horizontal or vertical surfaces, and the final colony size desired. While many different types of cages have been used, ranging in size from small and large plastic boxes, through various types and sizes of glass jars and aquaria, to large metal containers and plastic or metal garbage cans, the types which have been found to be of overall greatest use are 1) round acrylic containers with tightly fitting lids; 2) rigid rectangular acrylic "refrigerator chests"; 3) wide-mouth gallon bottles, battery jars, and tall cylindrical plastic containers; 4) aluminum or

galvanized steel cages, usually of a large size; and 5) plastic garbage cans having semirigid lids that can be clamped tightly against the rim of the can by heavy steel handles.

These containers have the following features in common: 1) long-term durability, 2) ease of cleaning, 3) resistance to corrosion or being eaten by the cockroaches, 4) tightly fitting lids or the ability to have cheese cloth stretched tightly across their openings, and 5) all can be provided with a means of permitting airflow into the cage so that elevated humidity does not cause the food to become moldy or mites to become a serious problem in the colony.

Nearly all cockroaches thrive when provided with hiding spaces that approximate their body height. Additionally, most have a decided preference for resting on either horizontal or vertical surfaces. The harborage materials used must take these necessities into account and in addition 1) should be low in cost or extremely durable; 2) should facilitate, rather than hinder, the transfer of cultures; 3) should not interfere with or be harmed by the waterers; and 4) for many blattids, must be of a material that they can excavate and to which they can then cement and cover their oothecae.

The materials which have proved to be the best for meeting these requirements are 1) large-sized and medium-sized

papier-mache separators from fluorescent light tube cartons, 2) tempered sheet Masonite® in several configurations, 3) hardware cloth (1/4 inch mesh), 4) paper toweling and wadding, both of which are always used as adjuncts to other materials, and 5) pelleted laboratory bedding.

The materials *not* recommended for use are wood shavings, shredded paper, and rolls of corrugated cardboard. Many species find the oils from the wood shavings objectionable. Furthermore, shavings and shredded paper tend to get knocked into the waterers and act as wicks, turning the entire bedding into a wet mass that molds rapidly. Additionally, it is very difficult to remove nymphs from them when the cultures have to be transferred. Rolls of corrugated cardboard tend to be eaten by the cockroaches and then collapse; also, because of the air circulation problems they present, they tend to mold rapidly.

Large papier-mache separators are ideal harborage materials for raising most blattids, blaberids, and many blattellids. These separators cost nothing and can be obtained in large quantities wherever there is extensive use of fluorescent lighting. They provide a multitude of spaces and of horizontal and vertical surfaces, and they also admirably meet requirement 4 above. Most species do well

when provided with nothing more than horizontal stacks formed either by having alternating layers running crosswise to each other or by having them all run in the same direction, but offset so that the grooves of one layer sit atop the flat crests of the one beneath it.

The primary requirements for setting up cages are to provide adequate harborage and a means for keeping both harborage and food away from the waterers. Each type of cage has its own requirements. Since most can be used for both continuing and age-class culturing, the methods for doing the latter are discussed separately. *(The author goes on to discuss five types of cages suitable for rearing cockroaches. For details, consult the actual reference).*

Setting up cultures to produce large numbers of adults that are all approximately the same age requires either very large cultures or considerable lead time. The reason, very simply, is that one has only two alternatives: either the cultures must be of such a size that a sufficient number of freshly molted adults can be collected within a very short period of time, or it must begin with fresh oothecae (blattids), ootheca-bearing females (*Blattella* spp.), pregnant females (blaberids), or recently eclosed nymphs (all groups). In any event, it always requires building the cultures to a

large size in holding cages so that sufficient numbers become available.

No matter which of the nymph-collecting methods is used, a central problem remains: not all nymphs will grow at the same rate. Thus, there should be no expectation that they will all become adults at the same time. For this reason, if large numbers of adults of known age are required, it is best to start with a number of large age-classed nymphal cultures in order to be able to remove on a daily basis a sufficient number of adults that have emerged within a short time of each other.

All cultures must be transferred at intervals into fresh cages, both as a sanitation measure and because the population density within them becomes too high. For most species, the best way to judge when this should be done is to note the rate of water usage: in general, it is when a 300-mm horizontal waterer or a vertical waterer becomes depleted in 1 week or less.

For all but the large blaberids and species in garbage cans, the best way to set up a new culture is to take the top papier-mache separator or several Masonite[®] separators from the old cage and place it or them in a new cage. If the population densities have become extremely high, or if the species has started to eat the papier-mache or it has become

moldy, then the uppermost layer should be discarded and a new separator placed in the old cage, left for a period of time, and then transferred to the new cage. For species in garbage cans, placing separators in the can and allowing the roaches to crawl onto them is the best method for easily obtaining a sufficient number to transfer to a new cage.

Deep-freezing is the best method for disposal of specimens and cultures. It avoids the use of noxious chemicals and is far better than autoclaving, which always results in a wet, malodorous sludge that is difficult to dispose of properly. Freezing at -30°C . for 24 to 48 hr. kills everything and yields a relatively dry mass that easily can be scraped into a plastic bag and disposed of with the regular garbage. Before washing, the petroleum jelly should be scraped from the rim of the cage with a spatula, and any that remains is removed with a paper laboratory wipe. This eliminates leaving jelly films on the cages during washing and subsequent fouling (and blockage) of sinks and drain lines. The cages are then either filled with a strong, hot detergent solution or submerged in a tank of detergent solution, allowed to soak, and then washed. If metal cages are being used, they should then be wiped dry to prevent rusting or other corrosion.

The major "pest" problems that can occur in cockroach

cultures are mold growth, phorid flies, acaroid mites, spiders, beetles, and in multispecies cultures, other cockroaches.

(Editor's note: We have also experienced Psocoptera infestations by the thousands) It is necessary to eliminate them ("pests") from the incubator.

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*****Editor's Special Request*****
SHOW OFF YOUR KNOWLEDGE
Help with LINNAEAN GAMES

I have been helping the **Linnaean Games** Committee chairman Alan York collect questions for the Games, and I wish to offer you a chance to participate. Think up a good "College Bowl" type question, along with the correct answer, and submit it to **FRASS**, using any of the addresses I have listed on p. 1 (**E-mail is great if you so choose**). I will keep a file of all questions submitted, and pass them along to the chairman. Thanks in advance for your assistance – thinking up questions to keep ahead of today's graduate students is a worthy challenge!

INSECTS AVAILABLE

The *Insect Production Unit* of **Forest Pest Management Institute**, established in 1963, has developed into the largest of its kind in Canada, supplying the staff of **FPMI** and various establishments across Canada and the United States. Over 4.5 million Individual Insects, representing sixteen species, are reared annually. The majority of these are Eastern Spruce Budworm, *Choristoneura fumiferana*, 37% of which are supplied to outside clients.

Current production consists of the following species:

Actebia fennica

Black Army Cutworm

Bombyx mori

Silkworm

Choristoneura conflictana

Large Aspen Tortrix

Choristoneura fumiferana

Eastern Spruce Budworm

Choristoneura occidentalis

Western Spruce Budworm

Choristoneura pinus pinus

Jackpine Budworm

Dasychira pinicola

Pine Tussock Moth

Dioryctria abietivorella

Fir Coneworm

Gilpinia hercyniae

European Spruce Sawfly

Lambdina fiscellaria fiscellaria

Hemlock Looper

Lymantria dispar

Gypsy Moth

Malacosoma disstria

Forest Tent Caterpillar

Orgyia antiqua

Rusty Tussock Moth

Orgyia leucostigma

Whitemarked Tussock Moth

Orgyia pseudotsugata

Douglas-fir Tussock Moth

Trichoplusia ni

Cabbage Looper

If you have a need for any of these species, please contact:

INSECT PRODUCTION UNIT
Forest Pest Management Institute
Natural Resources Canada
Canadian Forest Service
1219 Queen Street East
Sault Ste. Marie, Ontario
CANADA P6A 5M7

***Editor's note:** Please remember that importation or interstate movement of any insect into or within the United States requires that you obtain a completed **APHIS-PPQ form 526**, regulating the movement of live insects.

HELP LINE/INSECTS WANTED:

Help Line & Insects Wanted

is a listing of people who need your expertise. They have encountered a situation that someone, somewhere, can no doubt solve for them. If you can be of service, please contact these people!

SALT MARSH CATERPILLAR

I am teaching an insect pathology class with a laboratory January 1996. I will be teaching the class every other year. I am looking for someone in the United States, if possible, who has an *Estigmene acrea* (**Salt Marsh Caterpillar**) colony that would be willing to send me some caterpillars. The **Salt Marsh Caterpillar** is very susceptible to cytoplasmic polyhedrosis virus. The virus in an infected individual turns the midgut cells white and is quite obvious to the untrained eye.

If you can help, or know of a colony of **Salt Marsh Caterpillar** (please note that **FPMI** no longer has **SMC**), please contact:

Dr. Ann E. Hajek
Entomology Department
Cornell University
6126 Comstock Hall
Ithaca, NY 14853
(607) 254-4902 telephone
(607) 255-0939 fax

CHRYSOMELID EGGS

We are rearing a chrysomelid beetle for the biological control of the tree *Acacia nilotica*, a rangeland weed in northwest Queensland, Australia. The beetle is native to semi-arid parts of Africa, where the rainfall is erratic and the trees leafless for much of the year. The insect diapauses as eggs laid in fissures in the bark on branches and twigs. Eggs can be kept for extended periods of time. The problem is getting them to hatch. Approximately 10% of eggs will hatch if they are wet and kept moist for more than 10 days. This percentage can be increased by also bleaching and sunning the eggs, however, we still have a less than 30% success rate. Any ideas as to how we can hatch a greater percentage of our eggs would be appreciated. Information and advice should be sent to:

Helen Nahrung and/or
Jennifer Marohasy
Alan Fletcher Research Station
Queensland Dept. of Lands
P. O. Box 36, Sherwood Q. 4075
Brisbane, Australia
61 7 3375 0725 telephone
61 7 3379 6815 fax
marohaj@cifec.qld.gov.au: E-mail

Help Line/Insects Wanted, contd.

**TRICHOGRAMMA for
CAROB MOTH**

At the present I am working on mass rearing *Trichogramma* spp. for the biocontrol of Carob Moth, *Ectomyelois ceratoniae*. I need help from colleagues who are working on Quality Control of mass reared *Trichogramma*. I would appreciate any information on this matter.

I have also worked on mass rearing of House Fly, *Musca domestica*, for production of its pupal parasites. We have discovered an easy way to separate the full grown larvae from the rearing media, prior to pupation, by pouring the used media in a strainer placed in a pan. The larvae pass through the strainer and will pupate in the pan if provided with paper strips. This method does away with flotation.

Abbas Ali Nasrollahi
Iranian Research Organization of
Science and Technology
(I. R. O. S. T.)
P. O. Box 15815-3538
Tehran, 15819, IRAN
98 21 8838340 fax

**WIRE PALI-DUNN
HAVE BUGS -- WILL TRAVEL**

I presented you with the challenge to help come up with excellent ideas to take entomology to kids, and Gary Dunn has responded, below.

Gary A. Dunn, Director of Education, Young Entomologists' Society, wrote an article he likes to call "BUGS-ON-WHEELS", reprinted here.

"BUGS-ON-WHEELS"

In 1987 I started visiting schools on an occasional basis to make presentations on insects and other arthropods. Within two years it became quite obvious that demand for special science programs in schools could provide a unique opportunity to reach young people and teach them about the incredible world of insects, and so I started a mobile insect education outreach program called "BUGS-ON-WHEELS". That first year (1989) I visited with a few more than 1,000 students; however, last year my "head count" was over 14,000!

While it is abundantly clear that there is a demand to know more about insects, and that the subject area (insects and spiders) has high interest appeal to young people, I have found that there is much more to it than meets the eye. It has taken me several years to build a series of programs that combine good science

(presented in an age-appropriate way) with a good time. I strongly believe that learning about insects should be fun, and I strive to entertain as well as inform my audiences.

Most of my presentations include three key ingredients:

1) insect artifacts; 2) live insects/arthropods; and 3) interactive materials and demonstrations.

Insect Artifacts: There is little doubt that young people (and adults for that matter) like to look at real insect artifacts, especially specimens of large and colorful exotic insects. However, there is nearly equal enjoyment and appreciation of local insects. Many people will have seen some of these same insects in their yards and parks, and they truly appreciate being able to know the name of "that interesting insect they saw on Auntie Jane's porch last spring."

Live Insects: It goes without saying that people are really excited about live specimens. As a presenter I enjoy seeing a young person experience the thrill of holding a giant African millipede in their hand, or their astonishment at hearing a Madagascar hissing cockroach for the first time. I currently maintain a traveling zoo of some two dozen minibeasts, including insects, spiders, scorpions, crustaceans, and millipedes, for use in my programs. While many tropical arthropods are easy to acquire (**editor's note: don't forget**

that a 526 form must accompany each acquisition) and care for (and make a great crowd pleaser), the exclusive use of tropicals is neither necessary nor desirable. Two native minibeasts that I use quite frequently are sowbugs and pillbugs (**Isopods**) and subterranean termites (**Reticulitermes spp.**). Both of these were acquired locally and are easy to maintain. The isopods do quite well in a plastic container with potting soil, a little leaf humus, and some sticks or bark for shelter. They will eat partially decomposed leaves and fruit or vegetable scraps. My termites were collected from beneath an old log and are kept in a one gallon glass jar. (An empty pop bottle was placed in the center of the jar before the termite/soil mixture was poured into the jar, and this forced the termites to tunnel next to the glass where they are visible). Both of these commonplace arthropods have generated a lot of interest because they are familiar, yet fascinating.

Interactive Materials and

Demonstrations: If you can't keep a group's attention, then there is no way you will ever get them to hear your message and to understand the information you are sharing with them. It is therefore desirable to surprise them with unexpected activities or props, and to use a little humor from time to time. This is where giant rubber bugs, costumes, puppets, and role-playing come

in handy. A few insect riddles, jokes, or poems can be useful in maintaining a connection with your audience.

If you are looking for more ideas on working with young people or teaching entomology to lay audiences, then I invite you to learn more about the Young Entomologists' Society. Insect and arthropod outreach education is our primary activity, and we accomplish our mission through a combination of publications, services, and programs. For example, two titles in our special publications series (**Project "B.U.G.S."** and **Organizing Bug Days and Insect Fairs**) are filled with hundreds of innovative ideas for teaching about insects and other arthropods. Our **"Buggy Bookstore"** catalog features more than 600 items that can be used in insect education outreach programs (and the proceeds from these sales help us in our educational mission). Each year, through workshops and training sessions, we introduce hundreds of teachers and other educators to innovative ways to teach about insects and spiders. Perhaps we could conduct a workshop for your staff? Our **"BUGS-ON-WHEELS"** bugmobile travels throughout many parts of the United States and we are always looking for hosts and sponsors. **HAVE BUGS, WILL TRAVEL!**

Respectfully submitted:

Gary A. Dunn
Director of Education
Young Entomologists' Society
1915 Peggy Place
Lansing MI 48910-2553
(517) 887-0499 phone/fax

Editor's note: I applaud Gary for this insight. I, too, have a time-tested program that I take to schools (but not so many as Gary) called **"Dr. Bug's Traveling Hexapod Show"**, complete with its own theme song, sung to an old Neil Diamond tune (*It's pretty corny, but then I grew up in central Indiana – well known for its corn!*). I encourage others to share their insights as well.

BOOKS TO PERUSE

(for the child in all of us)

An important but often overlooked part of being a professional is keeping up with related readings. Some areas of entomological literature get more attention than others, so here is a chance to catch up on some works you may have missed.

For over 25 years Eric Carle's **The Very Hungry Caterpillar** has demonstrated 3 life stages of the order Lepidoptera, basic counting skills, and the days of the week. Carle has other books, including **The Grouchy Ladybug**, **The Very Busy Spider**, and **The Honeybee and The Robber**, but **The Very Hungry Caterpillar** definitely stands out. Anyone who has ever struggled

to keep up with a caterpillar's appetite will enjoy this graphic and sometimes far-fetched catalog of the diet of this caterpillar.

Paul Fleischman's Newberry Award winning **Joyful Noise: Poems for Two Voices** put words to the sounds and actions of various insects. Mayflies celebrate their brief life, a moth serenades a porch light, and there is a requiem for insects killed by the first hard frost of the fall.

My favorite, "Chrysalis Diary", is an answer to one of my pet questions; what does an insect think about all the changes it goes through? It begins in November with "Cold told me to fasten my feet to this branch, to dangle upside down from my perch, to shed my skin" and finishes in March with "And now I recall that last night I dreamt of flying".

Eric Beddows's illustrations are almost textbook, but sometimes include elements that give the insects a few human qualities.

Bugz: An Extraterrestrial Pop-up Book written and constructed by Ron van der Meer, is a presentation of the findings of the "eccentric entomologist and insect psychologist" Dr. June Beadle, who's "original field notes" are included. Dr. Beadle's discovery of insect life on a remote moon of Saturn was "shunned by a skeptical scientific community" and forgotten until van der Meer

recently rediscovered it. The insects, which are similar to those on Earth, are divided into the orders of Flying, Biting, Stinging, Scary, and Noisy.

This book is often hard to find, but well worth it (**editor's note: I received a copy from the reviewer, and laughed until my ribs ached!**). Facts about Earth insects are slipped into descriptions of the Bugz, and the text, mainly inserted as commentary around the pop-up insects, is full of lines like: "Government Health Warning: Stinging Bugz can damage your skin and itch like there is no tomorrow", that any entomologist and even children entomologists know, will enjoy.

Here is the information you need to find these books on your own:

Carle, Eric. The Very Hungry Caterpillar. New York: Philomel Books, 1969.

Fleischman, Paul. Joyful Noise: Poems for Two Voices. New York: Harper & Row, 1988.

van der Meer, Ron. Bugz: An Extraterrestrial Pop-up Book. Philadelphia: Running Press, 1994. (the note on the back of this book says it may be ordered for \$12.95 + 2.50 S & H from: Running Press Publishers 125 S. 22nd St. Philadelphia, PA 19103-4399 -- but try your local bookstore first)

Respectfully submitted,
Beth Dickerson

POSITION ANNOUNCEMENT: INSECTARY MANAGER

Rhone-Poulenc, a leader in the agrochemicals industry, has an opening for an experienced Insectary Manager to provide leadership in the following areas:

- Provide large numbers of healthy insects of all species for screening.
- Develop and implement innovative/creative methods for rearing insects.
- Develop and maintain precise recordkeeping systems for all insect strains.
- Continuously improve the efficiency of the Insectary.
- Supervise, train, and develop subordinates.
- Stay abreast of new culture starts/directions/approaches.
- Participate in insecticide testing when necessary.

The successful candidate will possess a Ph. D. in Entomology or Biology and 5 to 7 years experience or a MS/BS degree with equivalent experience in rearing a variety of insects. Demonstrated planning and supervisory skills are necessary as is a proven track record for meeting customer needs. Good analytical, problem-solving, interpersonal, and communication skills are critical.

We offer a competitive compensation and benefits package. If you meet the above qualifications and desire consideration, please forward your resume with salary history in confidence to:

**R&D Human Resources-IM/RL
Rhone-Poulenc
P. O. Box 12014
RTP, NC 27709**

Editor's note: When I first challenged Beth with this project, she was not sure how her writing would come out for such a wide audience. I believe she has done an admirable job. If you wish to see more children's book reviews, or have some yourself that you wish to see publicized in **FRASS**, contact me and I will get the information put together, either to send to Beth, or as reviewed by the sender, whichever you prefer.

I am a great believer that if you challenge a child early enough with entomological goodies (*books, videos, live insects*), then they will not grow up to be entomophobic, but will develop a deep, abiding interest and respect for natural science. I challenge all you readers out there to come up with new ideas in this realm (*and I will be delighted to reprint them in FRASS*).

UPCOMING EVENTS


E. S. A. Annual Meeting
Las Vegas, NV
December 17 - 21, 1995
I hope to see you there!

XX International Congress of
Entomology
Florence, ITALY
August 25 - 31, 1996
I doubt I'll make this one!

Ron Wheeler replies that you have really responded with the mailing list update. If you know of someone who did not receive their **FRASS**, and wishes to; or just wants to join to see what they may find, encourage them, have them fill out this form, and send to:

Dr. Ron Wheeler, Manager
Pan-Pacific Research Center
The Solaris Group
27201 Cool Water Ranch Road
Valley Center, CA 92082

Ron really makes the editor's life easier by agreeing to keep up with, and printing on self-stick labels, the **FRASS** mailing list. If you respond, be sure to say "thanks, Ron".



If this job sounds familiar, it is because I have held it for the last several years. I am switching to 100% non-agriculture pest bioassays in 1996, thus creating an opportunity for someone with excellent Insectary Management skills.

I had hoped to work a quiz into this edition of **FRASS**, but did not think of a good one while sitting at the keyboard. Look for more quizzes in 1996. *Those toe-jam flies may end up somewhere unexpectedly!*

That about wraps it up for this **FRASS**, but we will chat again in March. I look forward to hearing from all you contributors!

FRASS Newsletter is a cooperative effort among the members of the Insect Rearing Group designed to provide a vehicle for communication among individuals involved in all aspects of insect rearing. **PLEASE PARTICIPATE** by sending editorial comments, short papers on rearing techniques, information requests, requests for starter colonies, your source list for supplies, items for sale or trade, announcements, appropriate meeting dates, and other related newsworthy items. Items may be edited as needed.

***This issue of **FRASS** is brought to you by **Rhone-Poulenc AG Company**; editor **J. W. Smith**:

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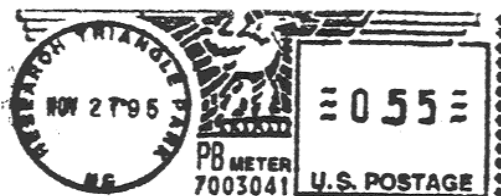
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Address changes or requests for subscriptions should be sent to,
(and a special thanks to maintaining **FRASS**'s mailing list):

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