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MUCIA/AID Project at
The Institute of Agriculture and Animal Sciences
of Tribhuvan University
Rampur, Nepal

End-of-Tour Report

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Introduction

I was recruited by MUCIA (Midwest Universities Consortium for International Affairs) for a second short term consultanship at IAAS (Institute of Agriculture and Animal Science), Rampur, Chitwan, Nepal. During this tour I was to help set up the IAAS photography lab, instruct the faculty on the proper use of the cameras, video, and darkroom equipment, set up new equipment received at IAAS and instruct the faculty on maintenance and repair, install the new Labconco fume hood, repair any equipment that was in need of repair, and conclude the inventory of MUCIA purchased equipment to facilitate transfer to IAAS.

IAAS Photography Laboratory

When I arrived at IAAS on 1 August, 1984, most of the work had been completed on the IAAS darkroom. It had been wired for both 220 VAC and 110 VAC, had the air conditioning unit installed, a bench with a sink, shelves, a drain, and a water source. The room had been painted with a water base paint instead of the oil based paint that I had previously recommended in my end-of-tour report of last year. Due to the large power drain during the day, the 220 VAC air conditioning unit would not operate (current dropped from 220 to 185 VAC). Also the transformer which had been installed to convert 220 VAC to 110 VAC had not been hooked up to the 220 VAC line yet.

The supply room which was to house the new photographic equipment upon arrival at IAAS in July of 1984, had a 110 VAC air conditioning unit installed, but was not in operation because there was no 110 VAC current to the room. I advised the staff at the Agricultural Communication Services Centre on the day that I arrived, that all of the photographic equipment and materials received should be placed in an air conditioned room immediately to prevent the growth of fungus on the camera lenses and the photographic film should be refridgerated (50 degree F), as is recommended by Kodak for Ektachrome professional films and black and white photographic papers. However, no effort was made to get the 110 VAC line into operation or move the film to a refridgerator.

After waiting for several days for the IAAS electricians to hook up the transformer to the 220 VAC line, I took Mr. Ram Sharma, of the MUCIA staff, over to the audio-visual center on 12 August, to assist me in getting the line hooked up. When we arrived at the center, the IAAS electricians were immediately sought out to do the work. Once the transformer was put into operation, it was found that there was not enough current to run the 110 VAC air conditioning unit in the supply room during the peak use hours of the day. Since the air conditioner could not be operated from 9 am to 5 pm, I advised Mr. Murari Suvedi that we should move the photographic equipment and materials from their present location to the air conditioned room anyway because the air conditioning unit could be run the rest of the time. However, nothing was done until 17 August when Mr. Om Bhadur, Mr.Suvedi and I got the equipment moved.

I advised Mr. Suvedi that due to the problem with the current drop during the day, a new power line should be installed that would bypass the other offices and supply the Agricultural Communication Services Centre with a constant 220 VAC source. Mr.Suvedi agreed and a new line was installed and put into operation on 23 August. Once the new line was hooked up, both air conditioners operated very well.

Once all of the power supply problems were solved, we then started to get the darkroom ready for operation. A small refridgerator from the MUCIA compound was installed on 17 August and the film and photographic paper was stored there. After requesting that all of the stray light be eliminated from the darkroom several times, a satisfactory job was finally done by Mr. Om Bhadur on 23 August.

On 26 August, I explained the operation of the Mamiya 330S twin lens reflex camera to Mr. Om Bhadur and Mr. Suvedi. We then loaded the camera and shot a roll of film. In the darkroom, we mixed the chemicals for processing black and white negative film, Pan-X (Dektol, Stop Bath, and Fixer) and then developed the roll of film that we shot. After allowing the film to dry, we then mixed the chemicals to process black and white paper (Microdol-X, Stop Bath, and Fixer) and made a contact print of the negatives and developed it. Exposure for the contact print was a real challenge with the fluctuating current in the darkroom.

Due to an ordering error, we did not receive the lens board or the negative carrier for the Beseler 23 CII enlarger. Without these two items, making prints would be difficult at best. But due to the creative imagination of the consultant and a couple sheets of cardboard and some tape, we were able to hook up the lens to the enlarger and effectively block out stray light from the negative to make prints. On 28 August, Mr. Om Bhadur and I made several prints from the film shot on 26 August. I explained to Mr. Om Bhadur the "tricks of the trade" for developing prints (dodging, burning in, etc.). When we finished, we mixed up a fresh batch of chemicals for use in the lab after I had left.

Before leaving IAAS on 29 August, I put together a set of directions for developing film, processing contact prints, and making print enlargements (see Appendix 1). I left one copy of the directions with the darkroom, Mr. Om Bhadur, and Mr. Suvedi.

I had also intended to teach a course on photography while at IAAS this year. I notified Mr. Suvedi and Mr. Kunwar of my interest in teaching this since we had all of this new equipment. Several of the faculty at IAAS also approached me about wanting to learn about photography.

I was informed by Mr. Suvedi, shortly after I arrived at IAAS that he would set up the time and dates for me to teach the course. When the final week of my tour came around, I asked Mr. Suvedi again about the course and he informed me that I would have to see Mr. Kunwar and that he had no authority to set up a photography course. I then talked to Mr. Kunwar, who at the time was the acting Dean of IAAS, and he told me that he would arrange for a place and time for me to teach the course. This never came about.

I had spent a considerable amount of time preparing a course on photography for presentation at IAAS. I have included the outline of the materials that I had intended to present in Appendix 2.

Student Extension Manual

On 13 August, Mr. Muarie Suvedi of the Resource Development and Rural Extension Department asked me to put together a brief description of the operation of slide projectors, movie projectors, overhead projectors, and cameras, for a manual that he was putting together for his students. I advised him that the most important thing for the students to do was to read the instruction manual first. The following paragraphs were presented to Mr. Suvedi for his manual.

Bell and Howell model 2592 Movie Projector

This movie projector is of the "self loading" type. The film is inserted into the take-up spool and the projector loads itself. All that remains to be done is to insert the film into the take-up reel after it has been threaded through the projector, and the focus and volume levels set. For further explanation on the projector control, consult the instruction manual for the unit. This unit operates on 110 VAC current and should be plugged into a 110 VAC outlet or into a step down transformer, which converts 220 VAC to 110 VAC.

Problem Checklist for Movie Projectors:

1. Film will not thread:
   - Projector set for the correct film type?
   - Film perforations damaged?
   - End of film square?
   - Pressure pad properly positioned?
   - Film track obstructed?
   - Projector operating in forward?

2. Film jumps in the projector:
   - Film perforations damaged?
   - Pressure pad properly positioned?
   - Supply reel damaged?
   - Film properly lubricated?

3. Take-up reel fails to catch end of film:
   - correct reel used?
   - Reel placed on spindle correctly?
   - Reel damaged?
   - End of film square?

4. No sound:
   - Volume turned up?
   - Magnetic sound track on film?
   - Film wound correctly?

The Overhead Projector

To operate the overhead projector, it must be plugged into a 110 VAC outlet or a step down transformer. The only controls on the unit are the on/off switch and the focus knob. The only precautions for using this unit (besides the proper line voltage) is to never operate the projector when the fan is not working and to leave the unit plugged in when it is turned off to allow the proper amount of time for the fan to cool the lamp.

Problem Checklist for Overhead Projectors:

1. Lamp does not come on:
   - Lamp burned out?
   - Lamp fully seated?
   - Power cord connected?

2. Fan does not operate:
   - Power cord connected?
   - Projector turned on?
   - Fan burned out?
   - Obstruction in fan?

The Slide Projector

The operation of the slide projector is really very simple. On the rear of the unit is the on/off switch and also the outlet for the remote control. On the side is a series of controls that are used to focus, advance and reverse the slide, and a selector knob that enables the slide tray to be manually rotated or removed. After the slides are loaded into the slide tray, the tray is then placed on the projector with the "0" position aligned with the slide gate index marker. Once a slide is in place in the projector and has been focused properly, it can then be advanced either manually by depressing the button on the projector itself, or by using the remote control. When the slide presentation is complete, the slide tray can then be removed by pressing the select button on the side of the projector and rotating the slide tray to the "0" position. The lamp should then be turned off, leaving the fan on to cool the bulb. Never turn the projector completely off until the air blowing out of the rear of the projector is cool. The slide projector operates on 110 VAC current only. Either plug the unit into the 110 VAC line or use a step down transformer which converts 220 VAC to 110 VAC.

To load a slide tray, first turn the empty tray upside down to check that the slot in the metal base plate is aligned with the "0" slot in the plastic housing. If it is not aligned, simply rotate the metal plate until the slot lines up with the "0", at this point, a spring loaded catch will lock the base plate in position. Next, turn the slide tray right side up and remove the plastic locking ring by turning it in the direction of the arrow marked "UNLOCK". Place the slide tray directly in front of you with the #1 slot on the right hand side. Hold the slide so that the image appears normal, then invert the slide and insert it into the tray, starting at slot #1. After all of the slides have been loaded into the tray, replace the plastic locking ring and turn it in the direction of the arrow marked "LOCK".

Problem Checklist for Slide Projectors:

1. Cannot focus slide:
   - Slide itself in sharp focus?
   - Lens properly installed?
   - Slide reversed?

2. Slide fails to drop into projected position:
   - Base plate properly indexed?
   - Tray properly positioned on projector?
   - Slide mount warped or frayed at corners?

3. Cannot project slide:
   - Power cord connected?
   - Lamp burned out?

4. Uneven illumination:
   - Lamp fully seated?
   - Condenser lens installed?
   - Condenser lens properly seated?
   - Slide mount properly seated?

5. Cannot cycle to next slide:
   - Tray properly positioned?
   - Base plate properly indexed?
   - Stack loader properly seated?
   - Slides fully seated in stack loader?

The 35 mm Camera

A general description of the operation of a 35 mm camera is very difficult without having prior knowledge of the camera controls. The first thing to do is READ THE INSTRUCTION MANUAL that comes with the camera. Once the controls are understood, the basic operation is as follows:

Once the camera has been loaded with film and the ASA/ISO (film speed) knob has been set, the camera is ready to take pictures. The basic controls that will be used in the picture taking process are: the f/stop (aperture), shutter speed, lens focusing ring, film advance lever, and the shutter release button. The Nikon FM2 has a light metering system built into the camera that will let the user know, by a series of light emitting diodes (LED) whether the exposure is too dark (-), too light (+), or correct (0). When the meter indicates "0", the picture can then be taken. The film is then advanced for the next exposure.

Some general rules that should be followed:

1. Do not use a shutter speed slower than 1/60 of a second for hand held pictures with a 50 mm lens. For the 135 mm lens, the hand held speed should be at least 1/125 second.

2. For shutter speeds slower than above, as for low light situations, use a tripod.

3. For fast moving objects, such as a person running, use a fast shutter speed of 1/250 second or faster.

4. Keep track of your exposures. Write down the f/stop and shutter speed. When the film has been developed, compare the slides with your exposure information. If the slides are too dark, the f/stop (aperture) was too small, if the slides are too light, the f/stop was too big.

The best way to master the art of photography is to learn from your mistakes. To know what your mistakes were, you need to record the exposure information for each exposure and compare it with the finished product.

Camera Problem Checklist:

1. Cannot advance film:
   - Film already advanced?
   - End of film?

2. Cannot trip shutter:
   - Film fully advanced?
   - Shutter locked?

3. Poor exposure:
   - Inadequate lighting conditions?
   - Recommended flash distance exceeded?
   - Proper film in camera?
   - Batteries properly installed?
   - Batteries in satisfactory condition?
   - Battery contacts clean?
   - Camera focused for flash?
   - Camera exposure meter on?

4. Blurred pictures:
   - Camera movement during exposure?
   - Subject movement during exposure?
   - Subject closer than minimum focusing distance?
   - Lens dirty?
   - Lens focused properly?

Media Center Building (proposed)

On 6 August, Mr. Narayan Kunwar, Assistant Dean of Academic Affairs at IAAS, asked me to design a new media center building for IAAS. This new building would house all of the audio-visual equipment, color and black and white darkrooms, office space, and classrooms. I put together a basic design for the building along with a list of the equipment that would be appropriate (see appendix 3). In my reply letter to Mr. Kunwar, I stated to him that I was not an expert in building design, but I could put together a rough design and make some suggestions as to the equipment to order.

Instrument Maintenance

After returning home from my last consultantship in Nepal, I contacted several laboratory equipment companies and asked for advise on the maintenance of laboratory equipment in hot, humid climates, such as Rampur, Nepal. Recommendations from the companies (Labconco Corporation, Perkin-Elmer, Orion Research Incorporated, and Sargent-Welch Scientific Company) are summarized as follows.

1. Instruments should be left on continuously, except for battery operated models. The heat generated by the unit itself will help dissipate any moisture.

2. Instruments not being used should be put in a plastic cover together with some silica gel (a dessicant). This will help to decrease the humidity around the instrument.

3. A simple measure used in the Southern United States, particularly along the Gulf Coast, before the general advent of air conditioning, was the "hot box". This is a sturdy cardboard or corrigated board carton, large enough to completely cover the individual instrument. A 100 watt incandescent lamp is installed inside the carton. Whenever the instrument is not in use, the carton is placed over it and the lamp is turned on. The inside of the box will remain dry and so will the instrument. The "hot box" works if it is used assiduously and is placed over the instrument during all idle periods, even those no longer than 15 minutes.

4. The application of a fine instrument oil to all metal parts which will tolerate it and by judicious applications of a liquid bacteriostatic/fungicidal agent designed for instrument use can be used where the "hot box" is impractical. Cleaning and reapplication are required continually together with care and good knowledge of the instrument.

5. Moisture proofing of various instrument parts. Photodetectors, as is in a spectrophotometer for example, are rinsed thoroughly with alcohol, oven dried, and then sprayed with a dehumidifying agent which excludes moisture from leakage surfaces. This treatment is time-consuming and, thereby, expensive. In the case of the photodetector, its replacement means that the humidity-proofing must be repeated.

The companies also stated that temperature is probably not a big factor in Nepal with most of the equipment. The ambien operating temperature range for most of the laboratory instruments is 15 to 40 degrees Centigrate (59-104F).

The main problem encountered with kjeldahl nitrogen determination equipment, fat extractors, and crude fiber analysis apparatus is in the high ambient temperature settings and the lack of cooling water through the condenser sections of the apparatus. This would be particulaly the case with the fat extractor equipment utilizing low boiling point solvents. The solvents would not condense within the condenser head unless a sufficient supply of cool water were passing through the head lowering the boiling point of the solvent. This of course would result in incomplete fat recovery from the sample. The same problem would exist on the nitrogen apparatus as well as on the crude fiber apparatus since both of these pieces of equipment utilize a water jacketed condenser system. The only way to correct such problems is to utilize a source of cool water or a self contained refridgerated recirculatory system capable of providing approximately 3 gallons per minute water flow through the system and circulating this water through the apparatus so as to maintain cool condenser operating temperatures.

Another possible problem in connection with the kjeldahl apparatus and high humidity situations would be the affinity of sulfuric acid to the humudity in the air. Such exposure within a high humidity laboratory would result in heavy condensation of moisture around the sulfuric acid exposure points in the fume manifold. This problem could be overcome by insuring that sufficient negative pressure was created within the fume manifold to exhaust the sulfuric acid fumes. It would also be advisable to wash this system down on a regular basis so as to prevent the accumulation of sulfates on the manifold and other parts on the apparatus where sulfuric acid might be exposed to the high humidity within the laboratory itself.

Perkin-Elmer and Orion Research Incorporated also gave me the location of two laboratory repair centers in India.

The Scientific Instrument Company
3/7 ASAF Ali Road
New Delhi 110 001/India

Labindia
Post Box 239 Naupada
Janaki Nivas
Dr. Moose Road
Thane 400 602/India
Telephone: 50-56-32
Telex: 011-6897, 011-6566 DBS IN
S.G. Bhalerao

Installation of the Labconco Fume Hood

In my short term report of last year (7 July - 9 Sept.) I recommended that the Labconco Explosion Proof Fume Hood, model 47, be installed in room 202A of the Laboratory Building. Upon arrival to Rampur on 1 August, I found that the fume hood location had been changed from room 202A to a position in the hall between room 202 and the stairwell. A solid cement wall was built to seal off the area from the outside. This wall was later found to be inadequate without a window, so a hole was broken out of the cement and a window was installed. At the same time the window was being installed, a cement table was also being formed along the west side of the room to hold the fume hood.

When I discovered that the fume hood location had changed from my original recommendation, I had a meeting with the Team Leader, Dr. Herbert L. Whittier. I informed Dr. Whittier that this new location for the fume hood was not good and my reasons for this are as follows:

1. Locating the fume hood in the hall would subject it to the variations in the weather, particularly, the humidity. When using the fume hood with the kjeldahl apparatus, humidity can be a problem, specifically, the sulfuric acid used in the experiment. Sulfuric acid has an affinity to moisture and would therefore collect around the surfaces of the hood.

2. There is no provision for electricity, water, and a drain system in the hall. Room 202A has all of these already present and available. If the hood is installed in the hall, electricity would have to be run to the hood, a water source would have to be located and tapped, and a drain system would have to be installed, increasing the total cost of the fume hood installation.

3. One of the major problems with the operation of fume hoods is that of insuring that there is a sufficient negative pressure created inside the hood to exhaust fumes. According to the installation directions that came with the fume hood, the hood, "...should be positioned such that it is out of the traffic pattern and away from air disturbances such as doors, windows, air conditioning or ventilation supply or return outlets, etc. Hood location is very important as extraneous air currents can disturb the airflow entering the hood."

4. The hallway location will make it difficult for other departments to make use of the hood. It is necessary that there be a water supply and an adequate drain system available. It is also important to have a room that can be locked in order to store equipment when not in use.

On 13 August, a meeting was called by Dr. Whittier to discuss the fume hood location. Present at the meeting were Dean Sinha, Dr. Whittier, Dr. Combs, Mr. N. Kunwar, Dr. K. Pyakural, Mr. S. Sapkota, Mr. P.P. Sharma, Dr. N. Chaudari K.C., and I. Dr. Combs outlined the major points for discussion at the meeting and had it xeroxed for all of the participants (see Appendix 4). P.P Sharma and Dr. K.C. were not interested in listening to my concerns over the placement of the fume hood or those of Dr. Combs. Their decision had been made and no other logical alternatives would be discussed. The installation of the fume hood was allowed to continue in the hallway.

On 29 August, I met with Mr. B.R. Khukaral on the proper installation of the fume hood once the site was prepared. We unpacked the fume hood, installed the front cover panel and assembled the explosion proof lamp. There was a dent on the right side of the hood frame which will need to be straightened out for the hood to function properly. With the aid of the IAAS electricians, we wired the 230/115 VAC explosion proof motor for 230 VAC, hooked it up, and found it to work properly.

I then advised B.R. on the proper hook up of the ventilation duct. Plastic tubing should be ordered to connect to the fume hood exhaust manifold of an equal diameter to ensure unrestricted air flow from the hood chamber. This plastic tubing should exit the room where the fume hood is to be installed through the existing hole in the wall. The tubing should then travel up the side of the Laboratory Building and extend at least 3 meters above the roof, so that anyone smoking on the roof wil not ignite the vapors being exhausted. At the end of the tubing, there should be a vent installed that would restrict entry by birds and also prevent rain from entering.

When the fume hood is set in place, all the wiring should be enclosed in conduit piping as advised in the installation manual. This conduit should extend from the power source, all the way to the motor of the fume hood, and also enclose the wires running to the explosion proof lamp. If the wiring is not enclosed and wires are left bare, any flammable chemical fumes could be ignited. For

saftey precautions, the switch to the fume hood should be outside of the fume hood room, unless an explosion proof switch can be installed. Also, any additional light fixtures or electrical outlets to be located inside of the fume hood room will have to be explosion proof.

B.R. assured me that a wall will be built to close off the fume hood from the hallway. This wall is to extend from the floor to the ceiling, thus sealing off the fume hood from the rest of the building. The installation of this wall should seal the room properly and conform to the set up instructions in the installation manual regarding room air currents.

Upon leaving IAAS on 30 August, 1984, the fume hood was still not installed. The cement for the table top was still wet and there had been no provision for electricity or water. A drain had been installed by knocking a hole in the new wall, thus allowing water or chemicals to drain from the floor, to the hole in the wall, and down the side of the Laboratory Building.

Equipment Repaired at IAAS

The following items were worked on during my tour at IAAS, Rampur. Their present status is listed.

1. Bausch and Lomb Spectrophotometer 21 UVD - sent to Kathmandu for repair.

2. Bell and Howell 2592 movie projector - repaired 8/3/84 (replaced drive cam)

3. Beseler 23 CII enlarger - set up 8/3/84.

4. Mita Copystar 9000 copier - overhauled 8/13/84.

5. Seed Germinator - 8/15/84 not repairable.

6. Coleman 51 Ca Flame Photometer - set up 8/23/84.

7. 300 Kg Livestock scales - set up 8/23/84.

8. 1400 Kg Livestock scales - set up 8/23/84.

9. Labconco Fume Hood - wired 230/115 VAC motor to 230 VAC 8/29/84.

All of the equipment that I had worked on during my previous tour at IAAS was either still working or had not been used since it was repaired last year.

IAAS Equipment Inventory

During the close out period of the project, we came across some old records of equipment received at IAAS, but not recorded on the inventory that I did last year. An updated version of the inventory, including these items and the newly received equipment, in Appendix 5, at the back of this report.

The numbering system code to identify the various items is as follows:

1. The first letter indicates th origin of the item.
   A = air shipment from the USA
   C = local cash purchase in Nepal
   P = pouch shipment from the USA
   S = surface shipment from the USA (ship)
   X = purchased by IAAS (non-grant item)
2. The next three digits indicate the shipment number.
3. The last two digits indicate the inventory sequence number.

Example: A-047-01 indicates the first item from air shipment number 47 from the USA.

The items on the inventory list have this code system labeled on them with a permanent ink marker. With this code system and the inventory list, one could easily locate the item on campus, determine its origin, the shipment number, the purchase price, and the date the item was received at IAAS, Rampur. This system was set up so that it could easily be stored on the Apple II Computer in the IAAS Computer Centre in the Library.

Beltronix Repair Shop

On 18 August I was in Kathmandu and visited with Mr. Bijaya K. Shrestha of Beltronix. Mr. Shrestha had invented an automatic protection devise for use in power transformers. It is a small battery powered circuit that is inserted into a transformer that protects the unit from power surges up to 305 VAC. These Savol curcuits have been used by several companies in the Kathmandu area for protection of their computers. Since the insertion of these Savol cicuits, none of the companies have experienced any transformer burn-outs due to power surges. I found Mr. Shrestha to be quite knowledgable in the area of electronics and would strongly recommend that he be contacted for the repair of any IAAS laboratory equipment or advice in the area of electronics. His address is:

Mr. Bijaya K. Shrestha
BELTRONIX Workshop
Chettrapati, Kathmandu
Phone: 211891

Appendix 1.

Enlarging Black and White Negatives

Step 1: Prepare the Dektol developer by adding one packet of Dektol to 946 ml of water, stirring constantly, then place in a container and label. The Stop Bath and Fixer are the same that were used for black and white negative film.

Step 2: Arrange the trays on the table so that the Developer tray is on the left, the Fixer tray is on the right, and the Stop Bath tray is in the middle. Place 1/2 inch of solution in its corresponding tray.

Step 3: Gently clean off the negative with a camel's hair brush, place in the negative carrier, emulsion (dull side) down and place in the enlarger.

Step 4: Place the enlarging easel below the enlarger, set the enlarging lens at its widest opening (smallest number), then turn off the lights and turn the enlarger on.

Step 5: Adjust the height of the enlarger so that the image on the easel appears as desired, then place the focusing magnifier on the easel and check the focus of the negative.

Step 6: Turn the room lights on, the enlarger off, and set the timer for 30 seconds. Set the enlarger at f/11 and turn the room lights off.

Step 7: WITH ALL LIGHTS OFF, remove a sheet of photographic paper from the packet, then reseal the packet. Place the paper on the easel, shiny side up, holding it by the edges and cover all but 1/6 of the paper with a sheet of cardboard.

Step 8: Turn on the timer, the enlarger will come on for only 30 seconds. Every 5 seconds, expose another 1/6 of the paper. At the end of 30 seconds, unplug the enlarger and set the timer for 1 1/2 minutes.

Step 9: With the LEFT HAND, slide the paper into the tray on the left (Developer) and start the timer.

Step 10: At the end of the Development time, with the LEFT HAND, remove the paper and slide it into the middle tray (Stop Bath) and set the timer for 10 seconds.

Step 11: At the end of the Stop Bath time, with the RIGHT HAND, remove the paper and slide it into the tray on the right (Fixer) and set the timer for 2 minutes. After 30 seconds in the Stop Bath, the room lights may be turned on.

Step 12: With the room lights on, view the print and determine the proper exposure. REMEMBER, the darkest strip received 30 seconds of exposure and the lightest strip received only 5 seconds.

Step 13: Once the proper exposure is determined, set the enlarger for that amount of time and then follow steps 9 - 11.

Step 14: Wash the final print in water for 4 minutes, then run it through the roller-squeegee to remove the excess water and place it in the drying rack.

Step 15: Pour the solutions back into their proper containers, clean up any spills on the table, and rinse out the trays.

Appendix 1 (cont)

Darkroom Procedures

Developing black and white film

Step 1: Mix Microdol-X developer (1:3), 100 ml Microdol-X + 300 ml water in a large graduated cylinder, then pour into the developing tank. Check the solution temperature and set the timer (see step 7).

Step 2: Mix the Stop Bath solution by adding 16 ml of Kodak Indicator Stop Bath to 1000 ml of water, then pour into a glass or plastic container and label the container - STOP BATH.

Step 3: Mix the Fixer solution by adding 1 packet of Kodak Fixer to 946 ml of water while stirring, then pour into a glass or plastic container and label - FIXER.

Step 4: Layout the materials needed for developing on the table so that they can easily be located in the dark (chemicals, reel(s), parts of the tank). It is a good idea to practice putting the tank parts together in the dark before trying to develop film.

Step 5: WITH THE LIGHTS OUT, load the film on the reel. For 35 mm, take apart the cassette, for 120 mm, remove the paper backing from the film. Hold the film by the edges only!

Step 6: Place the loaded reel(s) on the hollow plastic tube.

Step 7: The timer should be set for the following development time, depending on the developer solution temperature:

Solution Temperature	Development Time (min)
21 C (70 F)	11.0
22 C (72 F)	10.0
24 C (75 F)	8.5

Step 8: Place the reel assembly into the tank and start the timer. Gently tap the tank against the table to remove any air bubbles. With the tank assembled, agitate the reel for 5 seconds every 30 seconds.

Step 9: When the development time is over, pour the developer into the sink (the solution is only good for one time use), then add the Stop Bath solution and set the timer for 30 seconds. Gently agitate for 30 seconds.

Step 10: At the end of the Stop Bath period, pour the solution back into the bottle it came from and add the Fixer solution and set the timer for 8 minutes. Gently agitate for 5 seconds every 30 seconds.

Step 11: At the end of the fixing time, TURN ON THE LIGHTS, pour the Fixer back into its container and remove the top of the tank.

Step 12: Wash the reel of film under running water for 30 minutes. To shorten washing time, first rinse the film with Kodak Hypo Clearing Agent, then wash for 5 minutes.

Step 13: Hang the film on a film clip to dry, place a clip at both ends so that the film doesn't curl while drying. To shorten the drying time and to prevent water marks, rinse the film with Kodak Photo-Flow before drying.

Step 14: Rinse out all parts of the film tank and clean up any spills on the table.

Appendix 1 (cont).

Black and White Contact Prints

Step 1: Set the enlarger at f/11 and the timer for 8 seconds.

Step 2: WITH THE ROOM LIGHTS OFF, place a piece of photographic paper under the enlarger, glossy side up, and arrange the negatives on the paper. Place a sheet of glass over the negatives and paper.

Step 3: Turn the enlarger on and expose for 8 seconds.

Step 4: Follow steps 9 - 11 for developing black and white paper, then wash the contact print for 4 minutes, run it through the roller-squeegee and place it in the drying rack.

Note: If the print is too dark, reduce the exposure time by 1/2 (to 4 seconds). If the print is too light, increase exposure time by 2X (to 16 seconds).

Appendix 2.

Photography Course Outline

I. Film.

A. Sensitometry - how film sees color.

1. color negative film.

2. black and white negative film.

3. color slide film.

B. What type of film to use - depends on the color of the light.

1 daylight balanced color film.

2. tungsten color film.

3. color infra-red film.

4. black and white film - for any light source.

5. black and white infra-red film.

C. Film speed - how sensitive is the film to light.

1. ASA/ISO - the rate at which the film reacts to light.

2. ISO 400 - very sensitive to light.

3. ISO 64 - not so sensitive to light.

D. Exposure latitude.

1. positive (slide) films - 1 1/2 stop under to 1 stop over.

2. negative (print) film - 2 stops under to 2 stops over.

II. Exposure.

A. Basic rule - 1/ISO second shutter speed at f/16

Example: for ISO 64 slide film.
BRIGHT DAY = 1/64 (1/6Ø second) at f/16
HAZY DAY = 1/6Ø second at f/11
CLOUDY DAY = 1/60 second at f/8
OVERCAST = 1/60 second at f/5.6
OPEN SHADE = 1/60 second at f/5.6

B. How the camera reads the scene.

1. camera is programmed to expose the scene as neutral grey (18%)

2. camera meter will compensate for the amount of light.

   If the scence is bright, camera meter will darken the exposeure.
   If the scence is dark, camera meter will lighten the exposure.

C. Bypassing the overall camera meter reading.

1. move in close and meter the subject then shoot the scene.

2. meter the grass or a green tree receiving the same amount of light then shoot the scene.

D. Bracketing the exposure - if not sure of the proper exposure.

1. for slide film - shoot 1 stop over and 1 stop under.

2. negative (print) film - not necessary.

III. The picture - what is good.

A. Composition.

1. law of thirds - main subject should be located at one of the four intersections.

2. don't put the horizon in the middle of the picture.

3. keep the horizon level.

4. have a strong center of intersect.

5. look for colorful subjects.

6. use the best camera angle - low, high, eye level

7. allow subject room to move in the picture.

8. use leading lines.

9. look for striking patterns.

10. keep the background simple.

11. exclude the sky on overcast days.

B. Lighting.

For best results, take pictures early or late in the day, avoid taking pictures when the sun is overhead (noon).

C. Use the proper film.

Do not use tungsten film for daylight pictures.

D. Keep track of exposures.

The best way to master the art of photography is learn from your mistakes. The only way to learn from your mistakes is to know what you did wrong. The only way to know what you did wrong is to write down the exposure information for each picture, then compare it to the developed negatives or slides.

IV. The darkroom.

A. Mixing the chemistry.

1. Black and white film development.
   a. Kodak developer Microdol-X.
   b. Indicator stop bath.
   c. Kodak fixer.
   d. Kodak Hypo Clearing Agent.

2. Black and white print development.
   a. Kodak Dektol developer.
   b. Indicator stop bath (same as for film development).
   c. Kodak fixer (same as for film development).

3. Ektachrome slides - E-6 chemistry.
   a. First developer.
   b. Reversal bath.
   c. Color developer.
   d. Conditioner.
   e. Bleach.
   f. Fixer.
   g. Stabilizer.

4. Kodak Hobby-Pac for Ektachrome slides.
   a. First developer.
   b. Color developer.
   c. Bleach-Fix.
   d. Stabilizer.

B. Chemical storage and lab saftey.

1. E-6 chemistry (Ektachrome slides).
   a. store at room temperature 5-30 degrees Centigrate (41-86 F).
   b. solutions should be stored in full tightly closed glass bottles, if the solution is insufficient to fill the bottle, clean glass marbles may be added to raise the solution level to the top of the bottle to eliminate air.

c. storage life of solutions:

Mixed Solution	Used Solution	Unused Solution	Partly Full Bottle
First Dev. Rev. Bath Conditioner	4 weeks	8 weeks	1 week
Color Dev.	8 weeks	12 weeks	6 weeks
Bleach Fixer Stabilizer	24 weeks	24 weeks	24 weeks

d. lab saftey.
CAUTION: The First Developer, Reversal Bath, and Conditioner contain chemicals, with repeated contact may cause skin irritation and allergic skin reactions. May be harmful if swallowed. If swallowed, induce vomiting and call a physician at once.
POISON: Kodak Color Developer (part A) contains potassium hydroxide. It will cause severe burns to the skin and the eyes. Do not get in the eyes, on skin, or on clothing. Harmful or fatal if swallowed. When handling, wear goggles or a face shield. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. For eyes get prompt medical attention. If swallowed give milk or water. Do not induce vomiting. Call a physician at once. Note to the physician that this is a caustic solution and treat accordingly.
POISON: Kodak Stabilizer contains formaldehyde and methanol. It is a strong sensitizer, causes irritation of skin, eyes, nose, and throat. Avoid prolonged or repeated contact. In case of contact, immediately flush skin or eyes with plenty of water. Vapor harmful. Use with adequate ventilation. May be fatal or cause blindness if swallowed. Cannot be made non-poisonous. If swallowed, induce vomiting. Call a physician at once.

2. Black and white chemistry.
   a. store at room temperature 5-30 degrees Centigrate.
   b. solutions should be stored in full tightly closed glass bottles.
   c. storage life of solutions:

Microdol-X Developer	use once and discard
Dektol Developer	1 week
Indicator Stop Bath	2 months
Kodak Fixer	2 months
Hypo Clearing Agent	3 months

d. lab saftey.

CAUTION: Kodak Dektol and Microdol-X developers contain chemicals that with repeated contact may cause skin irritation and allergic skin reactions. Avoid breathing dust. May be harmful if swallowed. If swallowed, induce vomiting and call a physician at once.

POISON: Kodak Indicator Stop Bath contains acetic acid. It will cause severe burns to the skin and eyes. Avoid contact with eyes, skin or clothing.

C. Development times for black and white negative film.

Film and Developer	18.5C(65F)	20C(68F)	21C(70F)	22C(72F)	24C(75F)
	----development time (minutes)----				
PANATOMIC-X					
D-76	6	5	4 1/2	4 1/4	3 3/4
D-76 (1:1)	8	7	6 1/2	6	5
Microdol-X	8	7	6 1/2	5	5
Microdol-X (1:3)	-	-	11	10	8 1/2
PLUS-X PAN					
D-76	6 1/2	5 1/2	5	4 1/2	3 3/4
D-76 (1:1)	8	7	6 1/2	6	5
Microdol-X	8	7	6 1/2	6	5 1/2
Microdol-X (1:3)	-	-	11	10	9 1/2
TRI-X PAN					
D-76	9	8	7 1/2	6 1/2	5 1/2
D-76 (1:1)	11	10	9 1/2	9	8
Microdol-X	11	10	9 1/2	9	8
Microdol-X (1:3)	-	-	15	14	13

V. The Camera

A. Controls and terminology.

1. aperture - f/stop.

2. shutter speed.

3. focus.

4. depth of field.

B. Camera lens.

1. wide angle lens - 28 mm.

2. normal lens - 50 mm.

3. telephoto lens - 135 mm.

4. zoom lens - 36-72 mm.

C. Camera assesories.

1. filters.
   a. ultra-violet (UV) - absorbs ultra-violet radiation, eliminates fogginess in distant scenes, leave on lens for protection.
   b. polarizing filter (PL) - darkens blue skies,photographed at right angles to the sun without affecting color, reduces the reflection from non-metalic surfaces (ie. water, glass).
   c. red filter (25A) - absorbs the spectrum between UV and yellow provides the strongest contrast, also used in infra-red photography.
   d. yellow filter (K2) - absorbs part of the spectrum between UV and violet, makes clouds stand out in black and white photography.

2. bellows and slide copying attachment.

3. flash.

Appendix 3.

Equipment needs for the Media Center Building (proposed)

Learning Center
-study carrels
-display tables
-desk for checkout
-Singer Caramates
-cassette tape decks
-headphones
-supply of blank tapes

Classroom A
-desks
-chalkboard
-15 foot projection screen
-TV monitor
-podium

Classroom B
-desk
-chalkboard
-10 foot projection screen
-TV monitor
-podium

Editing Room
-xerox w/reduction ability
-graphics table
-graphics supplies
-light table
-slide viewer
-slide mounter
-film repair kits
-film splicer
-tape duplicator
-cutting board

Darkroom A (color)
-Beseler 23 CII enlarger
-Dichro 45 color head for enlarger
-enlarging lens for 35mm and 120mm
-color chemistry
-color processing equipment
-refridgerator
-print dryer

Darkroom B (black and white)
-Beseler 23 CII enlarger
-enlarging lens for 35mm and 120mm
-black and white chemistry
-film processing equipment
-refridgerator
-print dryer
-Ektachrome slide chemistry
-slide processing equipment

Maintenance and Repair Center
-repair manuals for all equipment
-basic tool kit
-oscillascope
-signal generator
-spare parts

Storage Room
-cabinets
-video supplies
-photographic supplies
-large refridgerator
-slide trays
-slide storage cabinet

Appendix 4.

The Problem: Location of the new fume hood.

1.0.0 Requirements

1.1.0 Essential technical requirements.

1.1.1 That the installation meet minimum standards for technical operation and saftey.

1.1.2 That the location have the following services:

1.1.3 Electrical: 110 VAC and 220 VAC service to operate the exhaust fan, air conditioner and analytical equipment.

1.1.4 Water: running cold water for circulation through the jacket of the fat extractor to lower the boiling point of ether.

1.1.5 Drains: sinks and drains for excess water.

1.1.6 Exhaust: exhaust of corrosive fumes to minimize hazard to personnel, facilities, and environment.

1.1.7 Air conditioning: to reduce the effects of humidity on equipment and to reduce hazard of sulfuric acid accumulation.

1.2.0 Other requirements.

1.2.1 That the fume hood be accessible to all departments which require its use.

1.2.2 That the location have facilities to accomodate all the apparatus to be used in the fume hood without necessitating their being carried from one laboratory to another.

1.2.3 That the use of the fume hood be compatible with other functions of the laboratory.

2.0.0 Alternative locations.

2.1.0 Room 100C.

2.2.0 Second floor alcove.

2.3.0 Room 202A.

2.4.0 Room 213.

IAAS

EQUIPMENT INVENTORY

AS OF AUGUST 19, 1984

INVENTORY CODE:

A001-001

Shipment mode -

A = air shipment
C = local purchase
P = pouch shipment
S = surface shipment
X = IAAS purchase

Shipment #

Shipment item #

DEPARTMENTS:

ACSC	Agricultural Communications Study Centre
AEP	Agricultural Engineering and Physics
AGR	Agronomy
ANS	Animal Science
BS	Basic Science
CC	Computer Centre
EXT	Resource Development and Rural Extension
HRT	Horticulture
LIB	Library
MC	MUCIA Compound
PP	Plant Protection
SSC	Soil Science and Chemistry

A - Air Shipment (MUCIA)

INV #	ITEM	COST	REC'D	DEPARTMENT
A003-01	T1620 calculator	$199.99	5/24/76	?
A003-01	T1620 calculator	199.99	5/24/76	?
A011-03	3M transparency maker #115391	119.50	8/9/77	ACSC
A011-04	Smith-Corona typewriter 75F166256297	125.00	8/9/77	?
A014-01	Burrows moisture computer #16740B	898.35	12/15/77	SSC
A014-02	Bouyoucos moisture meter	201.00	12/15/77	SSC
A014-03	Stirrer 220V	160.00	12/15/77	SSC
A022-01	Cornell drawers	30.75	3/20/79	PP
A022-02	Cornell drawers	30.75	3/20/79	PP
A022-03	Cornell drawers	30.75	3/20/79	PP
A022-04	Cornell drawers	30.75	3/20/79	PP
A022-05	Cornell drawers	30.75	3/20/79	PP
A022-06	Cornell drawers	30.75	3/20/79	PP
A022-07	Cornell drawers	30.75	3/20/79	PP
A022-08	Cornell drawers	30.75	3/20/79	PP
A022-09	Cornell drawers	30.75	3/20/79	PP
A022-10	Cornell drawers	30.75	3/20/79	PP
A022-11	Cornell drawers	30.75	3/20/79	PP
A022-12	Cornell drawers	30.75	3/20/79	PP
A022-13	Cornell drawers	30.75	3/20/79	PP
A022-14	Cornell drawers	30.75	3/20/79	PP
A022-15	Cornell drawers	30.75	3/20/79	PP
A022-16	Cornell drawers	30.75	3/20/79	PP
A022-17	Cornell drawers	30.75	3/20/79	PP
A022-18	Cornell drawers	30.75	3/20/79	PP
A022-19	Cornell drawers	30.75	3/20/79	PP
A022-20	Cornell drawers	30.75	3/20/79	PP
A022-21	Cornell drawers	30.75	3/20/79	PP
A022-22	Cornell drawers	30.75	3/20/79	PP
A022-23	Cornell drawers	30.75	3/20/79	PP
A022-24	Cornell drawers	30.75	3/20/79	PP
A022-25	Cornell cabinet	179.00	3/20/79	PP
A022-26	Cornell cabinet	179.00	3/20/79	PP
A022-27	Wiley Mill	2290.00	3/20/79	SSC
A030-01	Micro kjeldahl apparatus	163.12	11/28/80	SSC
A030-02	Micro kjeldahl apparatus	163.12	11/28/80	SSC
A031-01	Rotary power mower	130.00	3/28/80	ANS
A031-02	Automultidose syringe	40.55	3/28/80	ANS
A031-03	Fetal extractor	75.43	3/28/80	ANS
A032-01	Cream separator	459.10	3/19/80	ANS
A033-01	Incubator	139.47	7/11/80	ANS
A034-01	Sears refridgerator 7604	115.00	9/11/80	MC
A039-01	Maytag washer E2LP	396.30	7/19/80	MC
A040-01	Legal size binder	32.10	1/12/82	LIB
A040-02	Letter size binder	20.95	1/12/82	LIB
A040-03	Letter size binder	20.95	1/12/82	LIB

INV #	ITEM	COST	REC'D	DEPARTMENT
A041-01	Ohaus triple beam balance	$ 56.90	4/2/82	HRT
A041-02	8 place centrifuge head	102.47	4/2/82	SSC
A041-06	Hand held refractometer	311.20	4/2/82	PP
A041-07	Eberback shaker carrier	44.15	4/2/82	SSC
A041-08	Fisher magnetic stirrer	56.96	4/2/82	SSC
A041-09	Fisher magnetic stirrer	56.96	4/2/82	SSC
A041-10	Switch control board	120.00	4/2/82	AGR
A041-11	Readout control board	350.00	4/2/82	AGR
A041-12	Oscillator control board	290.00	4/2/82	AGR
A041-13	Soil bucket auger	55.00	4/2/82	SSC
A041-14	Soil bucket auger	55.00	4/2/82	SSC
A041-15	90 Kg Viking scale	28.75	4/2/82	ANS
A041-16	Germinator magnifier	27.75	4/2/82	AGR
A043-01	Apple II plus computer #234649	1208.70	6/8/82	CC
A043-02	Apple Disk II #0782	509.55	6/8/82	CC
A043-03	Apple Disk II #0882	435.75	6/8/82	CC
A043-04	Apple silent printer	312.05	6/8/82	CC
A043-05	Apple numeric keypad #008082	124.46	6/8/82	CC
A043-06	Sanyo DM8D12CX monitor	277.00	6/8/82	CC
A043-07	IDS 460G printer	929.90	6/8/82	CC
A044-01	Labconco crude fiber digestion unit	2026.83	11/9/82	ANS
A044-02	Goldfisch fat extractor	2611.93	11/9/82	ANS
A044-03	Lying press without plough	92.50	11/9/82	LIB
A044-04	Standing press	229.50	11/9/82	LIB
A044-05	Wall mount screen	49.10	11/9/82	LIB
A044-06	Foot powered stapler #F10548	368.00	11/9/82	LIB
A044-07	Stitching frame	75.50	11/9/82	LIB
A045-01	Ignition bomb unit #0882	71.52	5/5/83	ANS
A045-03	Calorimeter #4934	1446.63	5/5/83	ANS
A047-01	Singer Caramate #89675	468.63	5/16/83	ACSC
A047-02	Cassette player 654 #21104835	71.00	5/16/83	ACSC
A047-03	Cassette player 654 #21104836	71.00	5/16/83	ACSC
A047-04	Cassette player 654 #21104837	71.00	5/16/83	ACSC
A047-05	Cassette player 654 #21104838	71.00	5/16/83	ACSC
A047-06	Telex listening center #N471-2	73.42	5/16/83	ACSC
A047-07	Telex listening center #N471-3	73.42	5/16/83	ACSC
A047-08	Telex listening center #N471-4	73.42	5/16/83	ACSC
A047-09	Telex listening center #N471-5	73.42	5/16/83	ACSC
A047-10	Beseler projector G-100 #192540	166.85	5/16/83	ACSC
A047-11	Beseler projector G-100 #192543	166.85	5/16/83	ACSC
A047-12	Beseler projector G-100 #192584	166.85	5/16/83	ACSC
A047-13	Seerlite opaque projector	100.35	5/16/83	ACSC
A047-14	Rollfilm unit for 950 reader	59.00	5/16/83	ACSC
A047-15	Dalite tripod screen	78.15	5/16/83	ACSC
A047-16	Dalite tripod screen	78.15	5/16/83	ACSC
A047-18	Book tape applicator #04282A	38.99	5/16/83	LIB
A047-19	Microfische reader 956 #2501162	224.00	5/16/83	ACSC
A048-01	Kodak Ektagraphic proj. #5327514	227.80	5/16/83	ACSC
A048-02	Kodak Ektagraphic proj. #5367372	227.80	5/16/83	ACSC
A048-03	Sirtage projector case	27.20	5/16/83	ACSC
A048-04	Sirtage projector case	27.20	5/16/83	ACSC

INV #	ITEM	COST	REC'D	DEPARTMENT
A049-01	Insect container	$ 27.50	12/7/83	PP
A049-02	Insect container	27.50	12/7/83	PP
A049-03	Moisture meter	160.00	12/7/83	SSC
A049-04	Moisture meter	160.00	12/7/83	SSC
A050-01	pH meter	386.00	2/27/84	ANS
A050-02	Hot plate	138.61	2/27/84	ANS
A050-03	Hot plate	138.61	2/27/84	ANS
A050-04	Colony counter	315.04	2/27/84	ANS
A050-05	Incubator	255.67	2/27/84	ANS
A050-06	Incubator	255.67	2/27/84	ANS
A050-07	Water bath	273.15	2/27/84	ANS
A050-08	Water bath	273.15	2/27/84	ANS
A050-09	Sutton yogurt maker	14.19	2/27/84	ANS
A050-10	Milk pasturizer	147.95	2/27/84	ANS
A050-11	Timer	38.50	2/27/84	ANS
A050-12	Timer	38.50	2/27/84	ANS
A050-13	Hard operated homogenizer	116.52	2/27/84	ANS
A050-14	Multimeter	114.00	2/27/84	BS
A050-15	Multimeter	114.00	2/27/84	BS
A050-16	Barometer	124.49	2/27/84	BS
A050-17	Specific gravity balance	104.66	2/27/84	BS
A050-18	Balance	1632.40	2/27/84	BS
A050-19	Hot plate stirrer	128.11	2/27/84	BS
A050-20	Labcomco explosion proof fume hood #47	1825.50	2/27/84	SSC
A050-21	Coleman 51-Ca flame photometer #49819	2400.00	2/27/84	SSC
A050-22	Interval timer	34.80	2/27/84	AGR
A050-23	Apple II monitor	169.15	2/27/84	CC
A050-24	Apple II disk drive	300.00	2/27/84	CC
A050-25	Apple II disk drive	270.00	2/27/84	CC
A050-26	Voltage regulator	820.00	2/27/84	MC
A050-27	Timing light	40.60	2/27/84	MC
A050-28	Bell & Howell 16mm proj. #3031039	863.50	2/27/84	ACSC
A050-29	Bell & Howell remote control	32.50	2/27/84	ACSC
A051-01	Weight set	106.44	3/6/84	BS
A051-02	Weight set	106.44	3/6/84	BS
A051-03	Weight set	106.44	3/6/84	BS
A051-04	Weight set	106.44	3/6/84	BS
A051-05	Weight set	106.44	3/6/84	BS
A051-06	Cheese press	49.00	3/6/84	ANS
A051-07	Cheese press	49.00	3/6/84	ANS
A051-08	Cheese press	49.00	3/6/84	ANS
A051-09	Plant press	27.75	3/6/84	AGR
A051-10	Sling psychrometer model SAC	31.35	3/6/84	HRT
A051-11	Minitimer	20.64	3/6/84	HRT
A051-12	Minitimer	20.64	3/6/84	HRT
A051-13	Thermix stirring hot plate	168.80	3/6/84	HRT
A051-14	Hand powered grinding mill	66.00	3/6/84	HRT
A051-15	Hand powered grinding mill	66.00	3/6/84	HRT
A052-01	Thermodyne hot plate	72.00	4/27/84	HRT
A052-02	Thermodyne hot plate	72.00	4/27/84	HRT
A052-03	Measure master	72.50	4/27/84	HRT
A052-04	Measure master	72.50	4/27/84	HRT

INV #	ITEM	COST	REC'D	DEPARTMENT
A052-05	Micromaster EL microscope	$198.70	4/27/84	AGR
A052-06	Micromaster EL microscope	198.70	4/27/84	AGR
A052-07	Micromaster EL microscope	198.70	4/27/84	AGR
A052-08	Micromaster EL microscope	198.70	4/27/84	AGR
A052-09	Micromaster EL microscope	198.70	4/27/84	AGR
A052-10	Stereostar series 561 microscope	726.63	4/27/84	PP
A052-11	Stereostar series 561 microscope	726.63	4/27/84	PP
A052-12	Stereostar series 561 microscope	726.63	4/27/84	PP
A052-13	Stereostar series 561 microscope	726.63	4/27/84	PP
A052-14	Stereostar series 561 microscope	726.63	4/27/84	PP
A052-15	Stereostar series 561 microscope	726.63	4/27/84	PP
A052-16	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-17	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-18	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-19	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-20	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-21	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-22	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-23	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-24	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-25	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-26	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-27	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-28	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-29	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-30	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-31	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-32	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-33	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-32	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-33	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-34	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-35	A.O. model 2001 microscope	190.75	4/27/84	PP
A052-36	Fisher Accumet model 805 MP pH meter	680.00	4/27/84	SSC
A052-37	Fisher Accumet model 805 MP pH meter	680.00	4/27/84	BS
A052-38	Melting point apparatus	382.88	4/27/84	BS
A052-39	Melting point apparatus	382.88	4/27/84	BS
A052-40	Florescent illuminator	76.63	4/27/84	PP
A052-41	Florescent illuminator	76.63	4/27/84	PP
A052-42	Florescent illuminator	76.63	4/27/84	PP
A052-43	Florescent illuminator	76.63	4/27/84	PP
A052-44	Pole prunning saw	44.50	4/27/84	HRT
A052-45	Hudson 4 gal. sprayer	45.50	4/27/84	HRT
A052-46	Hudson 4 gal. sprayer	45.50	4/27/84	HRT
A052-47	Variable transformer	68.60	4/27/84	PP
A052-48	Variable transformer	68.60	4/27/84	PP
A052-49	Variable transformer	68.60	4/27/84	PP
A052-50	Variable transformer	68.60	4/27/84	PP
A052-51	Micro disecting set	469.60	4/27/84	PP
A052-52	Hygrometer, Mason type	38.95	4/27/84	PP
A052-53	Hygrometer, Mason type	38.95	4/27/84	PP

INV #	ITEM	COST	REC'D	DEPARTMENT
A052-54	C. Itoh Starwriter F-10 printer	$980.00	4/27/84	CC
A052-55	Cornell drawer	49.00	4/27/84	PP
A052-56	Cornell drawer	49.00	4/27/84	PP
A052-57	Cornell drawer	49.00	4/27/84	PP
A052-58	Cornell drawer	49.00	4/27/84	PP
A052-59	Cornell drawer	49.00	4/27/84	PP
A052-60	Cornell drawer	49.00	4/27/84	PP
A052-61	Cornell drawer	49.00	4/27/84	PP
A052-62	Cornell drawer	49.00	4/27/84	PP
A052-63	Cornell drawer	49.00	4/27/84	PP
A052-64	Cornell drawer	49.00	4/27/84	PP
A052-65	Cornell drawer	49.00	4/27/84	PP
A052-66	Cornell drawer	49.00	4/27/84	PP
A052-67	Cornell drawer	49.00	4/27/84	PP
A052-68	Cornell drawer	49.00	4/27/84	PP
A052-69	Cornell drawer	49.00	4/27/85	PP
A052-70	Cornell drawer	49.00	4/27/84	PP
A052-71	Cornell drawer	49.00	4/27/84	PP
A052-72	Cornell drawer	49.00	4/27/84	PP
A052-73	Cornell drawer	49.00	4/27/84	PP
A052-74	Cornell drawer	49.00	4/27/84	PP
A052-75	Cornell drawer	49.00	4/27/84	PP
A052-76	Cornell drawer	49.00	4/27/84	PP
A052-77	Cornell drawer	49.00	4/27/84	PP
A052-78	Cornell drawer	49.00	4/27/84	PP
A052-79	Cornell drawer	49.00	4/27/84	PP
A052-80	Cornell drawer	49.00	4/27/84	PP
A052-81	Cornell drawer	49.00	4/27/84	PP
A052-82	Cornell drawer	49.00	4/27/84	PP
A052-83	Cornell drawer	49.00	4/27/84	PP
A052-84	Cornell drawer	49.00	4/27/84	PP
A052-85	Cornell drawer	49.00	4/27/84	PP
A052-86	Cornell drawer	49.00	4/27/84	PP
A052-87	Cornell drawer	49.00	4/27/84	PP
A052-88	Cornell drawer	49.00	4/27/84	PP
A052-89	Cornell drawer	49.00	4/27/84	PP
A052-90	Cornell drawer	49.00	4/27/84	PP
A052-91	Cornell drawer	49.00	4/27/84	PP
A052-92	Kodak Ektagraphic zoom 100-150mm	56.00	4/27/84	ACSC
A052-93	Kodak Ektographic zoom 100-150mm	56.00	4/27/84	ACSC
A052-94	Kodak stack loader	30.89	4/27/84	ACSC
A052-95	Kodak stack loader	30.89	4/27/84	ACSC
A052-96	Nikon FM2 camera #7044450	229.95	4/27/84	ACSC
A052-97	Nikon FM2 camera #7092271	229.95	4/27/84	ACSC
A052-98	Nikon E 28mm f/2.8 #2069498	89.95	4/27/84	ACSC
A052-99	Nikon E 50mm f/1.8 #2796895	63.00	4/27/84	ACSC
A052-100	Nikon E 135mm f/2.8 #227260	104.00	4/27/84	ACSC
A052-101	Nikon PS-6 slide copier	98.00	4/27/84	ACSC
A052-102	Nikon SB-15 speedlight #777234	74.95	4/27/84	ACSC
A052-103	Mamiya C330S camera #W109232	309.95	4/27/84	ACSC
A052-104	Mamiya 80mm f/2.8 #966994	196.50	4/27/84	ACSC

INV #	ITEM	COST	REC'D	DEPARTMENT
A052-105	Gaylab 300 timer	$ 49.95	4/27/84	ACSC
A052-106	Beseler 23CII enlarger	269.95	4/27/84	ACSC
A053	Lost in Shipment			
A054-01	Thermograph	473.83	6/26/84	PP
A054-02	Purity work board 220VAC	158.00	6/26/84	AGR
A054-03	Purity work board 220VAC	158.00	6/26/84	AGR
A054-04	Purity work board 220VAC	158.00	6/26/84	AGR
A054-05	Purity work board 220VAC	158.00	6/26/84	AGR
A054-06	Purity work board 220VAC	158.00	6/26/84	AGR
A054-07	Dial-o-gram scale	206.95	6/26/84	AGR
A054-08	Triple purpose heat cab	422.00	6/26/84	AGR
A054-09	Floating arm magnifier	156.65	6/26/84	AGR
A054-10	Floating arm magnified	156.65	6/26/84	AGR
A054-11	Floating arm magnified	156.65	6/26/84	AGR
A054-12	Floating arm magnified	156.65	6/26/84	AGR
A054-13	Floating arm magnified	156.65	6/26/84	AGR
A054-14	Pole prunning saw	89.00	6/26/84	HRT
A054-15	Pole prunning saw	89.00	6/26/84	HRT
A054-16	Kensington system saver	76.90	6/26/84	CC
A054-17	Kensington system saver	76.90	6/26/84	CC
A054-18	Pole prunning saw	44.50	6/26/84	HRT
A054-19	Premier 18" trimer	50.00	6/26/84	ACSC
A054-20	Stereo microscope	553.20	6/26/84	PP
A054-21	Stereo microscope	282.05	6/26/84	PP
A054-22	Stereo microscope	282.05	6/26/84	PP
A054-23	Stereo microscope	282.05	6/26/84	PP
A054-24	Stereo microscope	282.05	6/26/84	PP
A054-25	Stereo microscope	282.05	6/26/84	PP
A054-26	Microtek 16K	76.72	6/26/84	CC
A054-27	Sharp RD-667 cassette recorder	204.00	6/26/84	ACSC
A054-28	Sharp RD-667 cassette recorder	204.00	6/26/84	ACSC
A054-29	Panasonic PK 557 color video camera	781.00	6/26/84	ACSC
A054-30	Panasonic Omnivision VHS-FV 5400	781.00	6/26/84	ACSC
A054-31	VTK/TV security cabinte	533.80	6/26/84	ACSC
A054-32	RCA 25" Colortrak TV receiver/monitor	581.00	6/26/84	ACSC
A054-33	Bogen 3020 tripod w/3028 head	74.20	6/26/84	ACSC
A054-34	Bogen 3020 tripod w/3028 head	74.20	6/26/84	ACSC
A054-35	Nikon E 36-72mm f/3.5 #1846406	188.00	6/26/84	ACSC
A054-36	Nikon PB-6 bellows	109.00	6/26/84	ACSC
A054-37	Nikon CF-27 case	32.95	6/26/84	ACSC
A054-38	Nikon CF-28 case	41.95	6/26/84	ACSC
A054-39	Mamiya case	29.95	6/26/84	ACSC
A054-40	Minolta 50mm f/2.8 C.E.	55.00	6/26/84	ACSC
A054-41	Minolta 80mm f/5.6 C.E.	57.55	6/26/84	ACSC
A055-01	Model C-5 cutter and slide tacker	175.00	9/10/84	ACSC
A055-02	Bogen video tripod	149.95	9/10/84	ACSC
A055-03	Repipet dispenser	58.39	9/10/84	SSC
A055-04	Test tube mixer	91.76	9/10/84	SSC
A055-05	Low silhoutte repipet	108.13	9/10/84	SSC
A055-06	Tyler portable sieve shaker	278.90	9/10/84	SSC

INV #	ITEM	COST	REC'D	DEPARTMENT
A055-07	Automatic burette	$ 37.66	9/10/84	SSC
A055-08	Automatic burette	37.66	9/10/84	SSC
A055-09	Soil sampler	450.00	9/10/84	SSC
A055-10	Seed germinator model 700	4875.00	9/10/84	AGR
A055-11	S-1 gadget bag	15.70	9/10/84	ACSC
A055-12	S-1 gadget bag	15.70	9/10/84	ACSC
A055-13	S-7 gadget bag	35.65	9/10/84	ACSC
A055-14	Hotplate	184.63	9/10/84	?
A055-15	3-bar pressure plate cell	85.20	9/10/84	SSC
A055-16	3-bar pressure plate cell	85.20	9/10/84	SSC
A055-17	3-bar pressure plate cell	85.20	9/10/84	SSC
A055-18	3-bar pressure plate cell	85.20	9/10/84	SSC
A055-19	5-bar pressure plate extractor	621.00	9/10/84	SSC
A055-20	Pressure plate manifold	468.00	9/10/84	SSC
A055-21	Pressure plate compressor	1340.00	9/10/84	SSC
A055-22	1-bar pressure plate cell	69.80	9/10/84	SSC
A055-23	1-bar pressure plate cell	69.80	9/10/84	SSC
A055-24	1-bar pressure plate cell	69.80	9/10/84	SSC
A055-25	1-bar pressure plate cell	69.80	9/10/84	SSC

C - Local Purchase (MUCIA)

INV #	ITEM	COST	REC'D	DEPARTMENT
C001-01	Aspee Napsak sprayer	$ 36.00	7/19/83	EXT
C001-02	Aspee Napsak sprayer	36.00	7/19/83	EXT
C001-03	Aspee Bolo duster with motor	144.00	7/19/83	EXT
C001-04	Foot pump sprayer	52.00	7/19/83	EXT
C001-05	Orient rotary duster	43.00	7/19/83	EXT
C001-06	Orient rotary duster	43.00	7/19/83	EXT
C001-07	Transformer/charger	?	?	CC
C001-08	Transformer	75.00	?	SSC
C001-09	Step down transformer 220V-110V	305.00	12/24/82	MC
C001-10	Paper cutter 15"	24.04	?	ACSC
C001-11	Heavy duty hole punch-3 hole	46.80	?	MC
C001-12	Projection screen 8'x8'	197.50	7/8/80	LIB
C001-13	Remington type. English #S151854	539.00	5/16/82	LIB
C001-14	Remington type. Nepali #S152676	595.00	5/14/82	LIB
C001-15	300 Kg platform scales	903.00	8/18/82	ANS
C001-16	Transformer	75.00	?	SSC
C001-17	Frequency meter 440VAC	58.00	4/9/81	MC
C001-18	Mita DC-232 copier #37001227	400.00	8/9/82	MC
C001-19	Autovoltage Stabilizer .5KVA	65.00	3/25/84	ACSC
C001-20	Stepdown transformer 1KVA	75.00	3/25/84	ACSC
C001-21	Stepdown transformer 1KVA	75.00	3/25/84	ACSC
C001-22	Autovoltage stabilizer 3KVA	155.00	3/25/84	CC
C001-23	Stepdown transformer 1KVA	75.00	3/25/84	CC
C001-24	Battery charger .5A	76.67	3/25/84	CC

P - Pouch Shipment (MUCIA)

INV #	ITEM	COST	REC'D	DEPARTMENT
P068-01	Kodak film strip adapter	$ 75.80	9/18/80	ACSC
P068-02	Kodak film strip adapter	75.80	9/18/80	ACSC
P506-01	Psychrometer #89051	70.55	12/12/78	AEP
P507-01	Barometer #43333	64.50	12/12/78	AEP
P542-02	Electric thermometer	49.37	2/2/79	AEP
P610-01	Eyepiece 25X	86.92	3/28/79	PP

S - Surface Shipment (MUCIA)

INV #	ITEM	COST	REC'D	DEPARTMENT
S012-02	Hygrothermograph	$220.00	10/11/76	AEP
S012-03	Rain gauge recorder PS21-S	410.00	10/11/76	AEP
S012-04	Wind speed recorder W123-DC	965.00	10/11/76	AEP
S015-01	Wood 60 cadet mower #0035187	789.00	6/16/77	?
S021-00	Micro kjeldahl unit	295.00	2/6/79	SSC
S021-01	Ainsworth balance AETA-N-N #58181	846.00	2/6/79	SSC
S021-02	Dial-O-gram balance	70.18	2/6/79	SSC
S021-03	Kjeldahl digestion unit #60300-1	509.30	2/6/79	SSC
S021-04	Stokes distillation unit 171-F	488.40	2/6/79	SSC
S021-05	Labconco flask carrier #65060	44.64	2/6/79	SSC
S021-06	Fisher Spec-21 #0204032J	1701.00	2/6/79	SSC
S021-07	Klett-Summerson colorimeter #43638	438.95	2/6/79	SSC
S021-08	Orion 601A pH meter #67499	453.53	2/6/79	SSC
S021-09	Wiley mill ED-5	2290.00	2/6/79	SSC
S021-10	Micro kjeldahl distillation unit	906.15	2/6/79	SSC
S027-02	Ohaus triple beam balance #NSA4387P	71.84	3/6/81	ANS
S027-03	Lyons Debeaker #75578-N-950-01	76.82	3/6/81	ANS
S027-04	Incumbation hatcher #C7847N	416.18	3/6/81	ANS
S027-05	Black light trap	75.00	3/6/81	PP
S027-06	Black light trap	75.00	3/6/81	PP
S027-07	Sears refridgerator #66121	289.95	3/6/81	MC
S027-08	Stepdown transformer 220V-110V	74.00	3/6/81	SSC
S028-01	Ohaus triple beam balance	87.79	4/26/81	SSC
S028-03	Ford two row planter	1612.65	4/26/81	AEP
S028-04	Grain plot thresher	1217.00	4/26/81	AEP
S030-01	Anemometer	357.00	7/21/82	ANS
S030-02	Ohaus 710 balance	60.64	7/21/82	?
S030-03	Ohaus 710 balance	60.64	7/21/82	?
S030-04	Ohaus 760 balance	53.28	7/21/82	ANS
S030-05	Ohaus 760 balance	53.28	7/21/82	?
S030-06	Ohaus solution balance #1190	335.61	7/21/82	HRT
S030-07	Ohaus undivided tail beam balance	113.55	7/21/82	SSC
S030-08	Dynac II centrifuge	768.53	7/21/82	SSC
S030-09	Voltage converter 500w	38.65	7/21/82	ANS
S030-10	Light/Dark germinator #8113	487.95	7/21/82	HRT
S030-12	Hand powered mixer	111.46	7/21/82	HRT
S030-13	Plant press	25.78	7/21/82	HRT
S030-14	Plant press	25.78	7/21/82	HRT
S030-15	Pyranograph	600.00	7/21/82	AEP
S030-16	Eberback variable speed shaker	545.79	7/21/82	SSC
S030-17	Aspee bakpak sprayer 1½ gal.	29.44	7/21/82	AGR
S030-18	Aspee bakpak sprayer 1½ gal.	29.44	7/21/82	AGR
S030-19	Cyclone 100 hand spreader	172.75	7/21/82	HRT
S032-01	193 lever cutter without stand	2038.00	4/27/83	LIB
S032-02	30H Hammermill	2133.30	4/27/83	ANS
S032-03	Horizontal batch mixer S30	7812.00	4/27/83	ANS
S033-01	1400 KG livestock scale	1763.17	7/17/84	ANS
S033-02	300 KG sheep scale	560.24	7/17/84	ANS

X - IAAS Purchase (non-MUCIA)

INV#	ITEM	DEPARTMENT
X001-01	Optronics PM1 pH meter	SSC
X001-02	Sargent-Welsh RB pH meter #77490220	SSC
X001-03	Modern analytical balance #170	SSC
X001-04	IAMC centrifuge IA 108 #4237	SSC
X001-05	Beseler opaque projector #H-708	ACSC
X001-06	Singer film strip projector #0100-02147	ACSC
X001-07	Viewlex film strip projector #P82174	ACSC
X001-08	GAF overhead projector	ACSC
X001-09	Argus 505 slide projector	ACSC
X001-10	Kalmart 75 movie projector #L32627	ACSC
X001-11	See A022-27	
X001-12	Automatic canner	HRT
X001-13	Automatic canner	HRT
X001-14	Bottle top applicator	HRT
X001-15	National Science Works balance	HRT
X001-16	Hoover vacuum	HRT
X001-17	Mini-mixer	HRT
X001-18	Standbio oven	SSC
X001-19	Modern analytical balance	SSC
X001-20	National Science Works balance	SSC
X001-21	Hamilton Beach mixer	SSC
X001-22	Waymaster scale	SSC
X001-23	Gestetner 320 mimeograph	MC
X001-24	Printofine X6 mimeograph	MC
X001-25	See C001-18	
X001-26	Mita Copystar 900D copier #47082593	MC
X001-27	Scientific Equip. drier	ANS
X001-28	Oven	ANS
X001-29	Griffin-Grundy drier	ANS
X001-30	Scientia Howrah balance	ANS
X001-31	Prem Poultry Appliances incubator	ANS
X001-32	Standard balance	ANS
X001-33	Universal Sci balance	ANS
X001-34	Rex hotplate	ANS
X001-35	Burrows drier #968110	ANS
X001-36	Roll-X automatic incubator	ANS
X001-37	See A030-01	
X001-38	Waymaster balance	ANS
X001-39	See A033-01	
X001-40	RTI transformer	ANS
X001-41	See A041-10	
X001-42	Tullu mixer #TCB4548	SSC
X001-43	Napco 630 drier	SSC
X001-44	Scientific Equip. hotplate	SSC
X001-45	See A030-02	SSC
X001-46	Karl Kolb centrifuge #79850	ANS
X001-47	Salter scale	ANS

INV #	ITEM	DEPARTMENT
X001-48	Drier	ANS
X001-49	Keroy Ltd. balance	ANS
X001-50	See A034-01	
X001-51	Aesculap-Werke sterilizer #221801	ANS
X001-52	Pressure chamber	ANS
X001-53	IRL microscope	ANS
X001-54	Olympus microscope	ANS
X001-55	Olympus DM-2 microscope	ANS
X001-56	Drier	AGR
X001-57	Scientific Equip. drier	AGR
X001-58	Duster	AGR
X001-59	Aspee rotary duster	AGR
X001-60	Aspee bakpak sprayer	AGR
X001-61	RSI pressure chamber	AGR
X001-62	Keroy Ltd. balance	AGR
X001-63	Bacteriological incubator	AGR
X001-64	Waymaster balance	AGR
X001-65	Olympus DM-2 miniscope	AGR
X001-66	Olympus DM-2 miniscope	AGR
X001-67	Olympus DM-2 miniscope	AGR
X001-68	Olympus DM-2 miniscope	AGR
X001-69	Olympus DM-2 miniscope	AGR
X001-70	Olympus DM-2 miniscope	AGR
X001-71	Olympus DM-2 miniscope	AGR
X001-72	Olympus DM-2 miniscope	AGR
X001-73	Olympus DM-2 miniscope	AGR
X001-74	Olympus DM-2 miniscope	AGR
X001-75	Lab Chem DM miniscope	AGR
X001-76	Lab Chem DM miniscope	AGR
X001-77	Lab Chem DM miniscope	AGR
X001-78	Lab Chem DM miniscope	AGR
X001-79	IRL microscope	AGR
X001-80	Gardener slicer	AGR
X001-81	IRL microscope	HRT
X001-82	Waymaster scale	HRT
X001-83	Waymaster scale	HRT
X001-84	Remington Standard typewriter	HRT
X001-85	Remington typewriter	MC
X001-86	Remington 150 typewriter	MC
X001-87	Remington typewriter	MC
X001-88	Sharp CS-1181 calculator	MC
X001-89	Royal typewriter	MC
X001-90	Gillette generator	MC
X001-91	Vitro sterilizer	ANS
X001-92	Cyclone hand spreader	ANS
X001-93	Dairy centrifuge	ANS
X001-94	IRL microscope	ANS
X001-95	IRL microscope	PP
X001-96	IRL microscope	PP
X001-97	IRL microscope	PP
X001-98	IRL microscope	PP

INV #	ITEM	DEPARTMENT
X001-99	IRL microscope	PP
X001-100	IRL microscope	PP
X001-101	Olympus DIC microscope	PP
X001-102	Olympus DIC microscope	PP
X001-103	IRL miniscrope	PP
X001-104	Olympus DM miniscope	PP
X001-105	Olympus DM miniscope	PP
X001-106	Olympus DM miniscope	PP
X001-107	Cornet traveling microscope	AEP
X001-108	Cornet traveling microscope	AEP
X001-109	Cornet traveling microscope	AEP
X001-110	Cornet traveling microscope	AEP
X001-111	Keroy balance	AEP
X001-112	Keroy balance	AEP
X001-113	Keroy balance	AEP
X001-114	Sett & De voltmeter	AEP
X001-115	Sett & De ampmeter	AEP
X001-116	Sett & De voltmeter	AEP
X001-117	Sett & De voltmeter	AEP
X001-118	Sett & De voltmeter	AEP
X001-119	Sett & De ampmeter	AEP
X001-120	Sett & De ampmeter	AEP
X001-121	Sett & De ampmeter	AEP
X001-122	Kohlrausch conductivity bridge	AEP
X001-123	Kohlrausch conductivity bridge	AEP
X001-124	Kohlrausch conductivity bridge	AEP
X001-125	Kohlrausch conductivity bridge	AEP
X001-126	Keroy balance	SSC
X001-127	Keroy balance	SSC
X001-128	Keroy balance	SSC
X001-129	Royal typewriter	MC