

Reducing Environmental Exposures by Teaching and Practising the Management of Pollutants

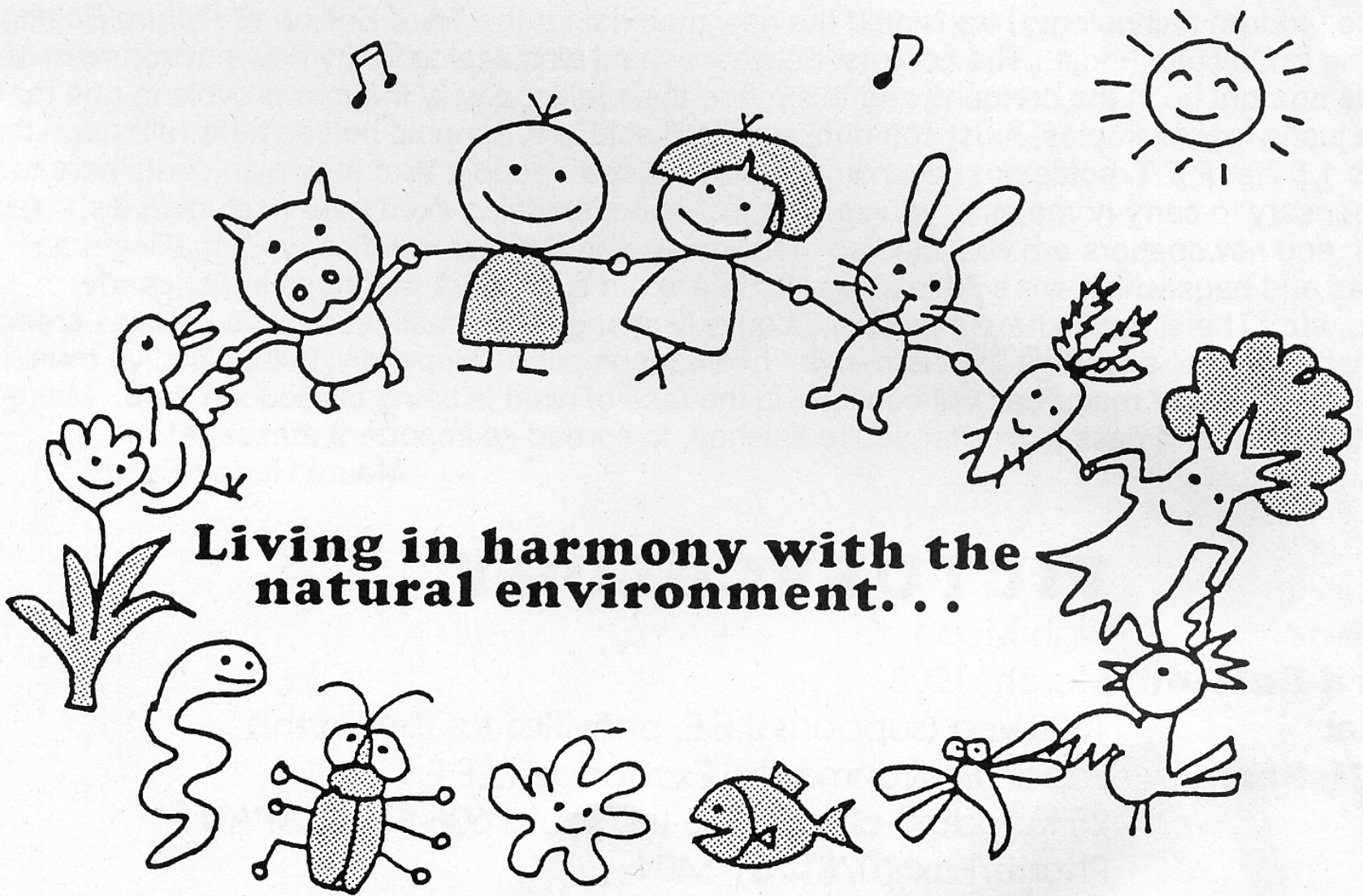
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Perth Australia, November 21, 2009

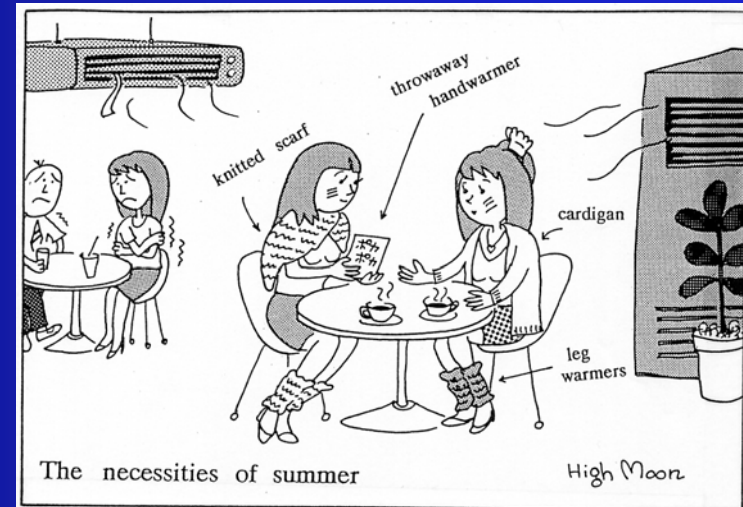


Living in harmony with the natural environment...

High Noon

Changing Attitudes

- More aware of the environmental damage we are doing to the earth
- Ideally, consuming less - energy, resources, products
- Looking for “Greener” Processes
- Scientists are responding: need to share with our students



Sharing Attitude and Knowledge with Our Students



- ❖ Ethically committed to responsible waste disposal
- ❖ Committed to reduction and elimination of hazardous waste
- ❖ Need to know how to do it

Involving Students in the Management of Hazardous Materials in the Laboratory

- Safe practices
- Using greener experiments
- Substituting less hazardous materials in an existing experiment
- Practising the management of hazardous waste



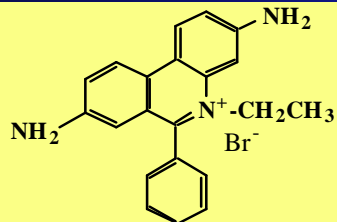
Examples of Disposal and Minimization Methods for the Student Laboratory

- Acid-base neutralization
- Conversion of toxic organic chemicals to non-hazardous ones
- Conversion of potentially explosive chemicals to less hazardous materials
- Precipitation of heavy metals as insoluble salts
- Recycling and exchange
- Spill Management



Conversion of a Toxic Organic Chemical: Ethidium Bromide

Oxidation with Hypochlorite



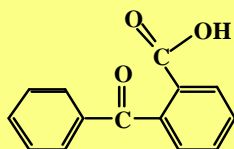
ETHIDIUM BROMIDE

**34 mg in 100 mL
of WATER**

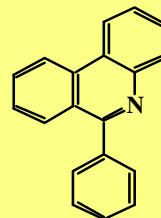
+

**300 mL of
HOUSEHOLD BLEACH**

**STIR FOR 2 HOURS
AT ROOM TEMPERATURE**



2-CARBOXYBENZOPHENONE



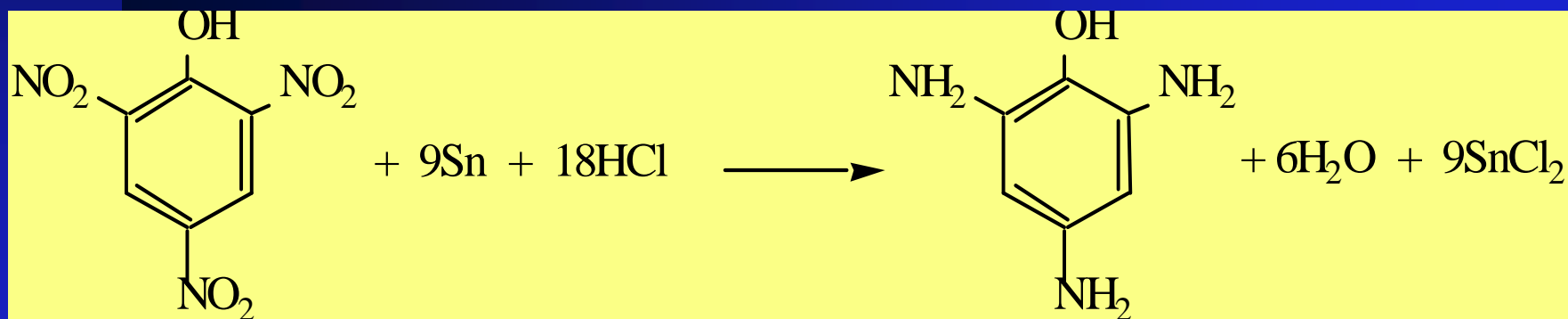
PHENYLPHENANTHRIDINE

Conversion of a Potentially Explosive Chemical

Picric Acid

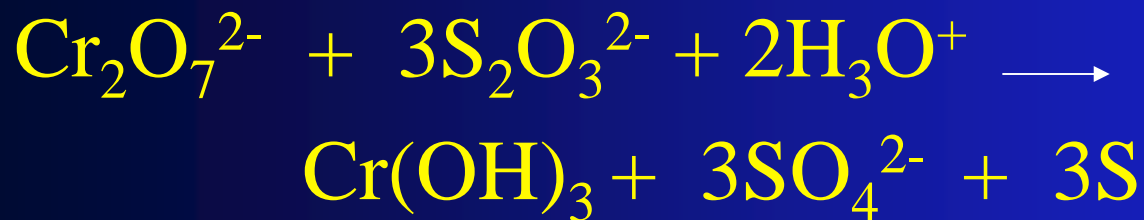
Reduce nitro groups with Sn

Oxidize the amine with acidic potassium permanganate



Precipitation of a Heavy Metal: Chromium Salts

Can be used as the final step in an experiment using chromium salts



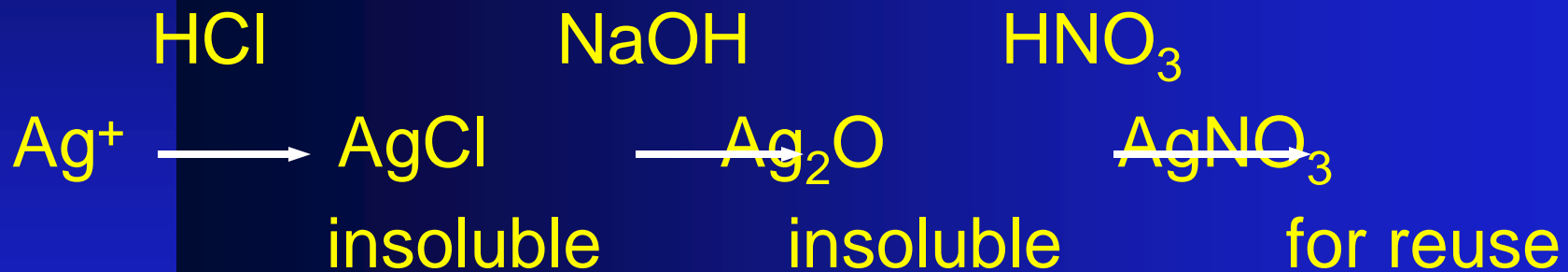
Precipitate with sodium thiosulfate solution

Precipitation of Copper Salts: an Example of a Bench Reaction Useful to Industry

- ❖ Copper sulfate used in electronic manufacture
- ❖ Precipitate with water glass (sodium silicate, soluble sand)
- ❖ Volume reduced
- ❖ Copper silicate is insoluble
- ❖ Copper silicate is one of the copper ores

Recovery of Silver Salts

Silver solutions which do not contain cyanide ion



Recovery of Silver Salts

Silver solutions which contain cyanide ion

NaOCl



HCl

NaOH

HNO₃



Teaching Exchange of Surplus Chemicals

- Chemical Exchange program
- Reduces waste for disposal
- Saves resources



Teaching the Handling of Spills

- ❖ Hazardous to health
- ❖ Speed of clean up essential
- ❖ Using Spill Mix
- ❖ Dispose of residue using waste disposal procedures



PREPARATION OF SPILL MIX

Mixture consists of equal parts by volume of:

- ❖ Sodium Carbonate (Soda Ash)
- ❖ Clay Cat Litter (Calcium Bentonite)
- ❖ Dry Sand

Have available in the laboratory

Conclusions

- As responsible scientists, must plan for appropriate waste disposal
- Ideal is to minimize waste formation to the greatest degree possible
- Good to teach students the importance of minimizing waste
- Procedures can be used wherever a variety of small quantities of waste are generated

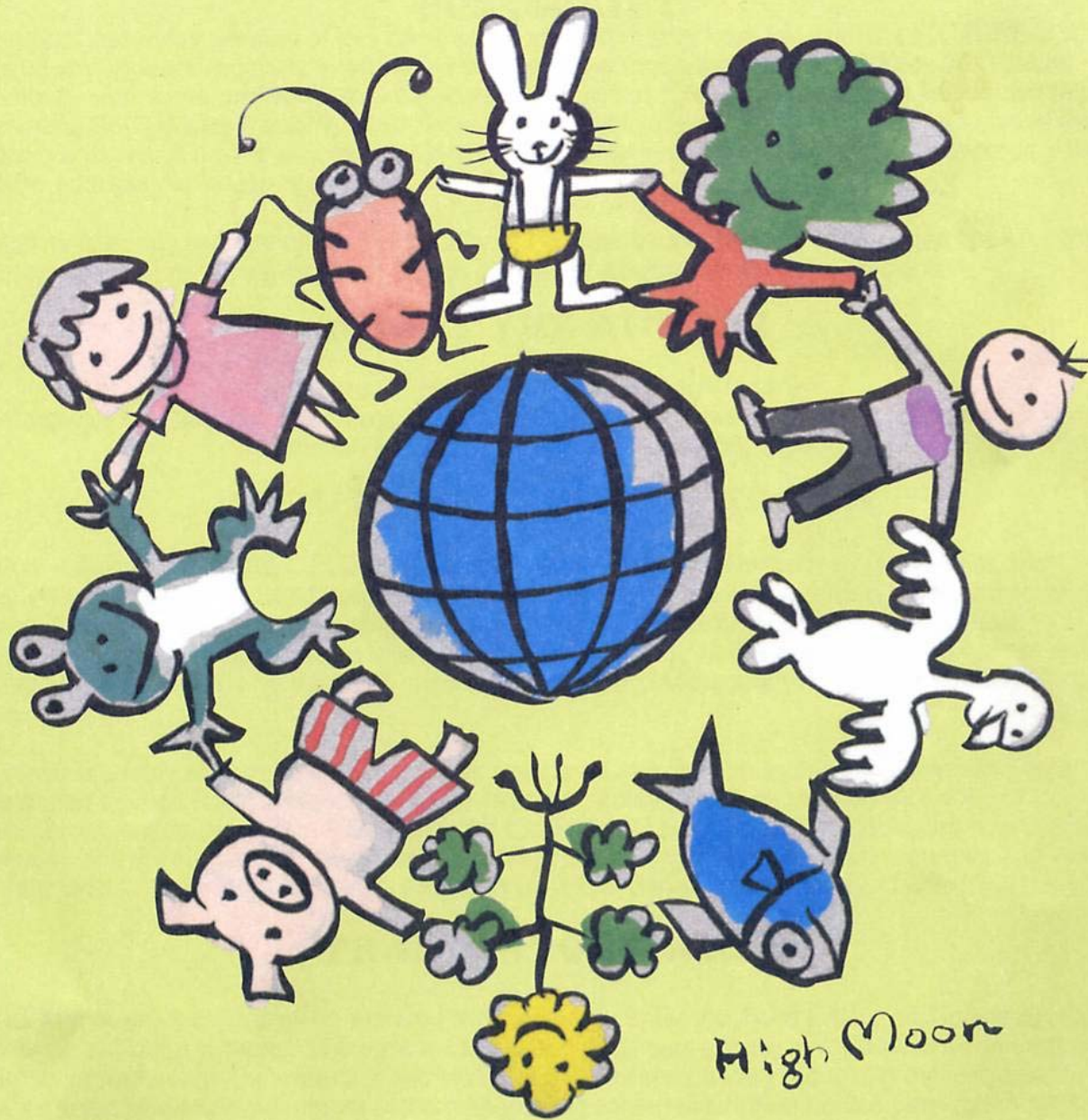
Coworkers

- Donna Ashick
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Thank
You