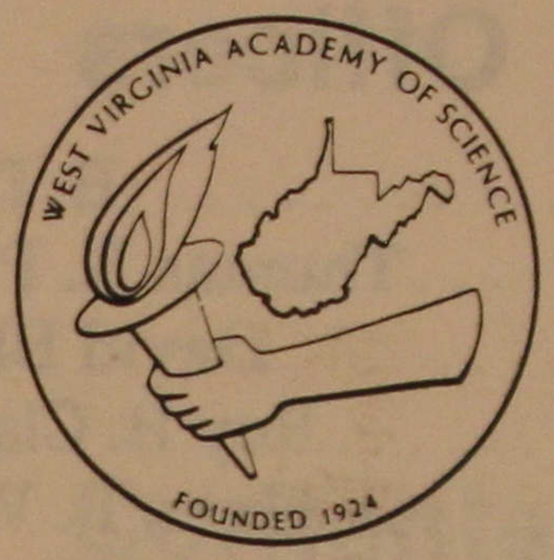
Volume 56, Number 1

Proceedings of the West Virginia Academy of Science 1984

Abstracts of papers for the Fifty-Ninth Annual Session



Proceedings of the West Virginia Academy of Science 1984

Vol. 56—No. 1

ABSTRACTS OF PAPERS FOR THE FIFTY-NINTH ANNUAL SESSION

West Virginia Wesleyan

Buckhannon, West Virginia

April 6-7, 1984

Printed by
McClain Printing Company
Parsons, West Virginia
March 1984

Cover Design
Meredith Pearce
West Virginia University
Office of Publications
Morgantown

West Virginia Academy of Science, Inc.

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Contents

Officers and Dues Structure ii

Institutional Members ii

Proceedings Information iv

Abstracts of Papers for the 1984 Meeting v

BOTANY 1

ECOLOGY-ZOOLOGY 5

CHEMISTRY-BIOCHEMISTRY 10

GEOLOGY 13

GEOLOGY-MINING 19

PHYSICS-ENGINEERING 22

BIOLOGY-SOCIOLOGY-PSYCHOLOGY 23

Instructions to Authors 26

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Abstracts of Papers

for the 1984 Meeting

Proceedings of the West Virginia Academy of Science

E. C. Keller, Jr., Editor

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Botany

DAVID F. BLAYDES, ROGER G. SEEBER, DENNIS R. HEINTZMAN, Department of Biology, West Virginia University, Morgantown, WV 26506-6057. The action of non-cytokinin 6-substituted purines on Nicotiana glauca callus growth

Nicotiana glauca can be cultured "in vitro" with no exogenous cytokinin on Miller's medium (Proc. WV Acad. Sci. Vol. 45, 1973). This medium contains mineral salts, sucrose, vitamins and a napthalene acetic acid. Cytokinin slows the growth of N.glauca tissue cultures on Miller's medium (Proc. WV Acad. Sci. 1979). We have studied the effect of substituted cytokinins on N.glauca callus for several years (Proc. WV Acad. Sci. Vol. 55, 1983).

The purine derivative 6-methyl purine (6-MP) is an analog of adenine in which a methyl group replaces the amino group at position 6. This analog inhibits the growth of N.glauca callus cultures. Concentrations of 6-MP used were all inhibitory with 0.1 mg/l, allowing only 85 percent of the growth of the control, 0.5 mg/l, 8 percent of control growth, and 1.0 mg/l, 4 percent of control growth. Kinetin at 0.5 mg/l reduced growth to 22 percent. These percentages are of fresh weight taken 29 days after inoculation.

Another analog, 6-methyl-amino purine (6-MAP) is of interest because it has cytokinin activity in soybean callus system when simultaneously added with adenine. Added alone, neither compound has cytokinin activity. We will discuss the action of 6-MP and 6-MAP on the growth of N. glauca culture.

WM. HOMER DUPPSTADT, Dept. of Biology, West Virginia University, PO BX 6057, Morgantown, West Virginia 26506. Eight New Species and other Noteworthy Collections for West Virginia.

Recent study at the West Virginia University Herbarium has revealed the following species new to the state: Isoetes riparia Engelm., Najas quadalupensis (Spreng.) Magnus, Ranunculus sardous Crantz, Cassia tora L., Vicia hirsuta (L.) S.F. Gray, Rhamnus cathartica L., Epilobium hirsutum L., Eupatorium capillifolium (Lam.) Small.

Forty-three years after the first collection, second and third collections of Carex eburnea Boott have been made.

ANN CUSICK MALONEY and DAN K. EVANS, Dept. of Biological Science, Marshall University, Huntington, West Virginia 25701. A taxonomic study of Carex Jamesii Schwein. and Carex Willdenowii Schkuhr (Section Phyllostachyae) in the Ohio River Valley.

Seven local populations of C. Jamesii and six of C. Willdenowii were characterized and compared to determine if reliable differentiation of the two taxa may be made via morphological and anatomical evidence. Twenty morphological characters were examined for each of 338 mature collections. Stepwise discriminate analysis was performed with and without classification as to species. Statistical and graphical analysis show that C. Jamesii and C. Willdenowii may be reliably separated on the basis of several morphological characters, particularly width of the achene, number of perigynia per spike, width of the pistillate scale and perigynium width. In mature specimens achene width alone may be used as a species indicator, with C. Jamesii having achene width of 1.6 - 2.3mm and C. Willdenowii achene width measuring 1.0 - 1.6mm. Other morphological characters are helpful in identification, but are not completely reliable. Anatomical and cytological characterization of these two species will also be discussed.

DAVID M. LAW, Dept. of Biology, The Pennsylvania State University, University Park, PA 16802. Determination of indoleacetic acid in a liverwort.

Previous attempts to identify indoleacetic acid (IAA) in bryophytes have depended on bioassay of extracts and identification by paper chromatography. Results were conflicting, and some workers concluded that IAA does not occur in bryophytes (New Phytol. 70: 519). Using a highly sensitive HPLC-electrochemical detection method (Proc. W.V.A.S. 54: 6; Biochem. Biophys. Res. Commun. 106: 1035), IAA was positively identified in axenically cultured, freeze-dried gametophytes of the liverwort Plagiochila arctica (supplied by D. Basile, Lehman College, NY). Identification was confirmed by R_t in several solvents, comparison of peak area ratios to those of standard IAA under various applied potentials, methylation and co-elution with methyl-IAA, and by acid/alkaline hydrolyses. Isotope-dilution analysis with ^{14}C-IAA yielded an estimate of 700 pmol Iaa g^{-1} dry weight, an amount comparable to levels reported for higher plants. This report is the first conclusive determination of IAA in bryophyte gametophytic tissue, and complements that of Thomas et al. for Pellia sporophytic tissue (Plant Physiol. 73: 395).

MARGARET ENGELMANN, Dept. of Biology, Bellevue College, Bellevue, Nebraska 68005 and TOM WEAKS, Dept. of Biological Sciences, Marshall University Huntington, West Virginia 25701. Relation between stripmining and the distribution of bryophytes in West Virginia.

Bryophyte communities were compared from three stream valleys in Mingo County, West Virginia. The stream valleys were typical of three stages of succession; undisturbed by human activities, disturbed by ongoing stripmining and recovering on abandoned and reclaimed stripmined lands.

Heterogeneity and equitability indices indicated that the recovering stripmined areas had the highest species diversity of the three stream valleys. However, the species richness index showed that the undisturbed stream valley had the highest species diversity. Bryophytes were found readily colonizing stripmine spoil. Species richness was higher on wet and moist spoil than on dry spoil. Species heterogeneity was not associated with moisture on stripmined spoil. High species diversity was found in a stripmined/filled area that had been prepared for revegetation. The results from this investigation support the suggestion that bryophytes should be included in the revegetation scheme.

KATHARINE B. GREGG, Dept. of Biology, West Virginia Wesleyan College, Buckhannon, WV 26201. Reproductive biology of the orchid Cleistes divaricata (L.) Ames growing in a West Virginia meadow.

A population of several hundred Cleistes divaricata (L.) Ames var. bifaria Fernald was observed from 1980-1983 in a meadow in Barbour County, WV, approximately 150 miles farther north than its published range in the state. More northern populations are known only in eastern Maryland and southern New Jersey. Most flowers exhibited the pale coloring of var. bifaria; however, a small number were rose, a shade more characteristic of southern or coastal plain individuals. Vegetative ramets of one, two, and three leaves were observed and were often attached underground to other vegetative or flowering ramets. Flowering stems, each producing one flower opening in early July, accounted for from 27-56% of the population. Fruit set ranged from 21-87%, but of those set, only about 50% reached maturity 11 to 15 weeks later. There was no obvious cause for the reproductive failure. Very little herbivory was evident, and fungal pathogens were virtually absent, although in some years they decimated capsules of sympatric Platanthera ciliaris and P. lacera. Pollinator exclusion cages showed that C. divaricata is not autogamous; artificial selfings produced healthy, fat pods. Two species of Bombus were captured after leaving the flowers carrying small clumps of pollen tetrads on their anterior dorsal thorax. No floral nectar or smell has been observed; neither did the flowers mimic those of any other species flowering concurrently in the meadow or nearby area. Reproductive strategy and problems of C. divaricata are strikingly different from those of 7 unrelated orchid species with which it is sympatric at this site.

Ecology-Zoology

DALE ADKINS, MIKE CARLISLE, BILL HAMPTON, JIM MEADOWS, DENISE SCHMIDT, DIANE SHIRLEY, BARRY WYANT, DONALD TARTER, Dept. of Biological Sciences, Marshall University, Huntington, WV 25701.
Limnological Investigations in Fourpole Creek, Cabell County, West Virginia.

Fish populations, benthic macroinvertebrates and water samples were collected from nine stations in Fourpole Creek, Cabell County, West Virginia. Eight fish families comprising 21 species were identified from the stations. A total of 367 fishes which weighed 5.4 kg were collected during the investigation. Game fishes comprised 7.1 percent of the total number of fishes and 9.6 percent of the total weight; forage fishes 80.1 percent by numbers and 60.3 percent by weight; and rough fishes 12.8 percent by numbers and 30.1 percent by weight. Benthic macroinvertebrates were represented by 11 orders, 20 families and approximately 26 species. The following benthic taxa were ranked according to percent frequency by number: Ephemeroptera (28.9), Gastropoda (12.3), Oligochaeta (11.2), Odonata (10.7), Isopoda (9.9), Decapoda (9.1), Diptera (8.6), Coleoptera (3.7), Hemiptera (2.7), Pelecypoda (2.1) and Megaloptera (1.6). The following physical and chemical parameters were recorded: dissolved oxygen, $\overline{X}$ = 7.2 (3.0-12.0) mg/l; total hardness, $\overline{X}$ = 235 (136.8-559.1) mg/l $CaCO_3$; bicarbonate alkalinity, $\overline{X}$ = 113 (34.2-290.7) mg/l $CaCO_3$; pH, $\overline{X}$ = 7.8 (7.5-8.5); and temperature, $\overline{X}$ = 25 (17-30) C.

DAVID JORDAHL, Department of Biology, West Virginia University, Morgantown, WV.
Comparision of Brook Trout Populations in an acidic and circumneutral stream.

Little Laurel Run and Roaring Creek, Preston County, West Virginia are third order soft water brook trout streams of similar mean annual discharge. Comparisions were made of trout population density and structure in two 200 meter sections of each stream. Sampling was done during late summer by electrofishing. Population density was estimated using single-census Petersen mark and recapture. Population structure was compared by length-frequency distribution. Young of the year trout were counted on three seperate days during late spring in each 200 meter section. Physical and chemical parameters including discharge, temperature, pH, alkalinity, acidity, hardness, and aluminum were monitored in each section at biweekly intervals for one year.

Little Laurel Run had a PH range of 4.7 to 5.6; with annual means of 5.2 and 5.4 for the two sections. The pH for Roaring Creek was 5.6 to 7.2 with annual means of 6.0 and 6.7. Late summer population estimates were 7 and 73 brook trout per 100m stream length for Little Laurel Run and Roaring Creek,

STEVEN L. STEPHENSON, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554 and HAROLD S. ADAMS, Dabney S. Lancaster Community College, Clifton Forge, Virginia 24422. Balsam fir in West Virginia.

Balsam fir (Abies balsamea), commonly present as a codominant species along with red spruce (Picea rubens) in the subalpine coniferous forests of the northern Appalachians, reaches its southernmost limit in the mountains of central West Virginia and northern Virginia. In West Virginia, indigenous populations of balsam fir occur at just four localities: (1) Canaan Valley in Tucker County, (2) Blister Run in Randolph County, (3) Blister Swamp in Pocahontas County, and (4) near Stony River Dam in Grant County. During the 1983 field season, quantitative data on the composition and structure of all strata of vegetation were obtained from representative stands containing balsam fir at three of these four localities. In addition, data were obtained on soil physical and chemical characteristics at these three sites. For the tree stratum (stems >10 cm DBH), balsam fir had an overall importance value of 46.2 in the sampled stands, with red spruce (19.8), hemlock (12.7), and yellow birch (10.8) the most important associates. Balsam fir also dominated in smaller size classes, which suggests that this species will continue to be important in these stands. Although the stands sampled in this study are ecologically similar to comparable spruce-dominated stands in central West Virginia, some compositional and structural differences do exist.

RODNEY B. GERBER, E.C. KELLER, JR., AND DONALD K. WERNER. Dept. of Biology, West Virginia University, Morgantown, WV, 26506. The Relationship of In-Stream Flow and Water Type in the Determination of Algal Species Distribution.

Stepwise regression analyses of in-stream flow and other variables were done on algal genera data within a series of eight homogenous water type segments of the Upper Monongahela River Basin. In-stream flow was important in only one of the eight segments in regard to its association with algal biomass distribution (The Westfork River). There is a large contrast between the influence of in-stream flow on algal biomass production versus its influence on algal genera distribution. There is larger influence of water type on algal genera distribution as compared to the lesser influence of in-stream flow.

The total range includes the unglaciated mountains of western Pennsylvania, eastern West Virginia, western Virginia, and western Maryland. Previous to this study the range of Virginia valeriae pulchra in West Virginia was thought to be limited to Preston County. The results of this study extend the range in West Virginia to include Pocahontas and Pendleton Counties. A specimen was reported in Greenbrier County during the Brooks Bird Club 1981 Foray, but subsequent visits to this area have failed to produce any specimens of this subspecies.

JOHN E. SCHMIDT and MICHAEL A. ZETO, Division of Water Resources, West Virginia Department of Natural Resources, Charleston, WV 25311. Progress Report: West Virginia Department of Natural Resources freshwater mussel(naiad) population inventory.

To date, ten major streams and three river basins within West Virginia have been investigated for freshwater mussel(naiad) populations. Three additional streams have been investigated, but no living naiads have been collected. The majority of this work has been conducted solely by Division personnel. Occasionally joint surveys have been conducted with Marshall University and the United States Fish and Wildlife Service. Sampling has been ongoing since mid-1980, and sampling techniques have included bank collection, water scopes, snorkeling and brailing.

A total of 48 naiad species plus the asiatic clam (Corbicula sp.) have been collected thus far. This number is expected to increase to approximately 60 as streams are investigated more thoroughly and additional streams are sampled.

AMY L. TARLETON, Dept. of Biology, West Virginia University, Morgantown, West Virginia 26506. Experimental microcosms show the ability of Sphagnum peat to remove iron from acid mine drainage.

Field investigations have shown that Sphagnum-dominated wetlands have the potential to chemically modify acid mine drainage (AMD). In this study, experimental microcosms were used to assess the ability of different types of peat to modify AMD waters of different chemical compositions. Plastic tubs, measuring 35x30x20 cm, were filled with one of three different types of peat: a) the top 15 cm of peat and live Sphagnum collected from Big Run Bog, Tucker County, WV; b) drained surface peat collected from an active peat mine in Garrett County, MD; and c) commercially available processed peat moss. Water added to the microcosms was collected either from Big Run, a stream not influenced by AMD (Fe$\leq$1 mg/L) or from 4 streams variously affected by AMD. These 4 streams had pH values ranging from 2.4 to 3.4 and Fe concentrations ranging from 10 to 170 mg/L. Over a 3 month period, at 1-3 day inter-

respectively. The late summer length-frequency distribution of Little Laurel Run trout sampled shows a low frequency of young of the year trout and absence of some larger size classes compared with complete representation of expected size groups and abundant young in Roaring Creek. Young of the year observations in the spring for both sections on Little Laurel Run averaged 0 and 2.7 per 100m stream length, comparative values for Roaring Creek were 8.1 and 10.1.

The low population density and altered population structure of Little Laurel Run trout with extremely low frequency of young seems to be indicative of marginal reproductive success primarily related to the acidic character of this stream.

DONALD G. KAIN AND JOHN E. SCHMIDT, Biology Section, Division of Water Resources, West Virginia Department of Natural Resources, Charleston, WV 25311. Toxicity to fathead minnows (Pimephales promelas) of oil and gas well drilling wastewater following field treatment.

Wastewater generated during the drilling phase of oil and gas production in West Virginia is typically acidic, with high concentrations of chlorides and metals. On-site treatment for metals and suspended solid removal and subsequent local disposal, via land application and/or metered stream discharge, has been proposed. Concerns over potential impacts to aquatic communities have led to intensive biological monitoring during experimental discharges. Laboratory (static) and instream acute toxicity tests with fathead minnows (P. promelas) have been conducted on selected sites.

Of 16 twenty-four-hour static tests, 7 showed no measurable toxicity, 3 were considered mildly toxic (LC50>75%), 2 moderately toxic (LC50 of 30-74%), and 4 highly toxic (LC50 < 30%). The lowest LC50 calculated was 10.8%. Toxicity was not clearly shown in any of the 5 instream (during discharge) tests.

Discharge at each site was a one-time event and generally lasted 24-48 hours. Discharge rates were based on a maximum wastewater/streamwater ratio of 1/300. Based on the short durations and high dilution rates of the discharges, impacts on aquatic communities were felt to be negligible.

THOMAS K. PAULEY, Dept. of Biology, University of Pittsburgh at Bradford, Bradford, PA 16701. The Distribution of Virginia valeriae pulchra in West Virginia.

Virginia valeriae pulchra (mountain earth snake) is a small brownish to dark gray snake that may have tiny black spots on the dorsum. It is found under flat sandstone rocks on grassy slopes near deciduous forests. The diet consists solely of earthworms.

total bacteria, and iron) with 1982 levels higher than the 1975-76 levels. Conversely, four variables (total phosphate, alkalinity, zinc, and turbidity) had generally decreased trends.

Throughout the upper basin, the variables which had generally higher values in 1982 were: nitrate, manganese, total bacteria, flow, and iron. Five variables showed general concentration decreases, viz, alkalinity, dissolved oxygen, zinc, turbidity, and phosphate.

vals, 250 mL of water were drained from the bottom of each microcosm and then enough water of a particular chemistry was added to replace drainage and evapotranspirational losses from the microcosm. From a complete accounting of water volumes and Fe concentrations in both input and output water, water and Fe budgets were calculated. For a 6-week equilibration period, all microcosms received water from Big Run. For the next 6 weeks, AMD was added to some microcosms, while others continued receiving water from Big Run as a control. Considerable amounts of Fe were removed from the AMD water by the wetland peat. For example, the microcosm with peat from Big Run Bog and additions of the AMD with 170 mg/L Fe removed 9 of the 11 grams of the added Fe. A comparable control microcosm retained 0.06 of the 0.17 grams of the added Fe. Mechanisms for the removal of Fe from solution by the Sphagnum peat include Fe adsorption onto organic peat and the formation of oxides and sulfides of Fe.

DONALD C. TARTER and MARK F. SHERIDAN, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25701. The Occurrence of the Leech Myzobdella lugubris Leidy on Notropis atherinoides Rafinesque from Little Hurricane Creek, Putnam County, West Virginia.

During a recent survey of the fishes from Little Hurricane Creek, Putnam County, West Virginia, the authors found the leech Myzobdella lugubris Leidy on the emerald shiner Notropis atherinoides Rafinesque. Only one shiner (caudal fin) was parasitized by the leech. The emerald shiner is a new host record for M. lugubris. Other cyprinid hosts for the leech include the golden shiner Notemigonous crysoleucas (Mitchell), carp Cyprinus carpio Linnaeus, and the striped shiner Notropis chrysocephalus (Mitchill).

DONALD K. WERNER, E.C. KELLER, JR., AND RODNEY B. GERBER. Dept. of Biology, West Virginia University, Morgantown, WV, 26506, Water Quality Changes in the Monongahela River Basin of West Virginia, 1975-1982.

Water quality data collected in the West Virginia portion of the Monongahela River basin in 1975-76 and 1982 included the Cheat, Tygart Valley, and Monongahela Rivers. In the Cheat River, four variables (nitrate, manganese, total bacteria, and iron) showed generally higher levels in 1982 than in the 1975-76 samplings. Three other variables (dissolved oxygen, hardness, and zinc) showed decreased trends over this same period. Similar trends were observed in the Monongahela River; six variables increased (conductivity, hardness, sulfate, manganese, nitrate, total bacteria, and iron), while five decreased (pH, dissolved oxygen, total phosphate, alkalinity, and turbidity) over the seven year period. The Tygart Valley River had four variables (nitrate, manganese,

Triton was released by DEAE cellulose gel chromatography and by batch absorption using Sephadex G-25. This solubilized receptor-I^{125}CSF complex can be precipitated by polyethylene glycol. The receptor was found to be stable up to 5 days at 4°C where 50% of the radioactive material associated with the receptor can be recovered. However, below 0°C, the receptor loses its stability within 24 hours as only 32% of the radioactive material associated with the receptor was recovered. Attempts were made to determine the molecular weight and further define this receptor by column chromatography. The molecular weight of this receptor was found to be more than 15,000,000 daltons which suggests aggregation of the receptors after isolation.

BERNARD KRABACHER, Chemistry Dept., West Virginia State College, Institute, West Virginia 25112.
Getting Started with a Microcomputer in the Chemistry Department of a Small College.

Several goals were set for the use of a microcomputer in the Chemistry Department at West Virginia State College. Some of these goals are: tutorial use for students, laboratory experiment simulations for students, departmental inventory, use in solving various mathematical equations, keeping student grades, interfacing with instruments, and use in keeping other departmental records. The talk will be concerned with the difficulty in getting started and some of the accomplishments to date.

DAWN SANTORA and CHRISTINE NEBIOLO, Dept. of Biology, Allegheny College, Meadville, PA 16335.
Presence of Protamine in Brown Trout.

Fish of the salmonid family, including trout, undergo physiological changes due to their anadromous nature. One of these changes may be the replacement of histones in the sperm DNA by the salmon type protamine. If this protamine type is found in anadromous fishes, it implies that the protamine may have evolved from an earlier protamine type in order to maintain the DNA structure in the sperm of the anadromous fishes. Protamine has previously been found in rainbow trout and herring, both of which have anadromous populations. Using polyacrylamide gel electrophoresis, it was found that protamine is present in brown trout testis. Rat testes, bovine testes, and trout liver which were run as standards, all contain different histone and nonhistone proteins. However, none of these contains protamine. Comparison of the brown trout protamine bands suggests that this protamine is of the salmon type. The species also has anadromous populations. Furthermore it seems that there is a double band of protamine in brown trout. The amount of protamine increases as the testis of the brown trout matures, analagous to the progression of protein types in rainbow trout.

Chemistry-Biochemistry

MAHMOUD AKRAM, LISA HASTON, HARRY MANGUS, MUKUL MAHESWARI, CHARLES D. OGLE, ERIC PAULEY, JON PAULEY, FAZALE RANA AND B. DAS SARMA, Dept. of Chem., WVSC Institute, WV, 25112. Bactericidal, bacteriostatic, bacterial filamentation by metal ions & the nature of Pt-DNA adducts in E. Coli incubated with cis $Pt(NH_3)_2Cl_2$ & Pt en Cl_2.

The effects of metal ions Cu(I), Cu(II), Co(II), Ni(II), As(III), Sb (III), Bi(III), Pb(II), Hg(I), Hg(II), Fe(II), Fe(III), Zn(II), Cd (III), and Cr(III) on E. Coli K-12 growing chemically defined media (Robert's C. NH_4Cl 2g, Na_2HOP_4 6g, KK_2PO_4 2g, NaCl 3g per liter, supplemented with 0.2% glucose and 0.4% casamino acids) at 37°C in a shaker water bath were studied. Only a few showed an filamentation, and elongation, if any, was never greater than 10X. The bactericidal and bacteriostatic action was irratic, depending on the anion, order of addition, and time of incubation. Somewhat more consistent results were obtained when the metal ions were added in an excess tartarate or citrate solution at pH 7.2 - 7.7. The data indicate that meaningful biolgoical activity of metal ions as determined by bacterial assay can only be obtained when not only the media, but also the nature of metal ions in the growing media are well defined.

It has been found (Das Sarma, et al, Chem. Bio. Interact 46, 219-232, 1983) that anticancer platinum(II) compounds have a mechanism distinct from that in their platinum(IV) analogs, at least in bacterial systems. Data from a comparative study of Pt-DNA adducts in analogous Pt(II) and Pt(IV) compounds incubated with E. Coli K-12 is being carried out by cation-exchange chromatography of adducts liberated by mild acid hydrolysis.

PAUL FIDELL and CHRISTINE NEBIOLO, Dept. of Biology, Allegheny College, Meadville, PA 16335, and R. K. SHATTUCK, Dept. of Hematology, University of Pittsburgh, Pittsburgh, PA 15213. The Isolation and Molecular Weight Determination of the Colony Stimulating Factor Receptor Site.

Colony Stimulating Factor (CSF) is required for the maturation and proliferation of granulocytes and macrophages. In the present studies, a technique has been developed for the isolation of the receptor specific to CSF. The Raw cells are a murine myelomonocytic leukemic cell line and were used in these studies. Results indicate that when $1x10^6$ Raw cells are incubated with 50 units of I^{125}CSF, an immediate binding occurs at the rate of approximately 25%. The Raw cells bind maximally when grown for 4-6 days at 37°C. The receptors specific to CSF attached to these cells are relatively unstable at pH 7.5. However, when the cells are placed in an acid condition of pH 4.0 the receptors stability is increased considerably. The receptor bond to I^{125}CSF was isolated from the cells by 0.1% Triton X-100. The

Geology

C. K. CARNEY, Dept. of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506. Petrology and Paleoenvironments of the Mississippian Greenbrier Limestone in Northern West Virginia.

A study of the Upper Mississippian Greenbrier Limestone at Greer, West Virginia, was conducted in order to determine lithologies and paleoenvironments. The exposure is in an abandoned quarry owned by the Greer Limestone Company. The total thickness measured was approximately 45 meters. All three of the stratigraphic divisions of the Greenbrier of northern West Virginia are represented in this outcrop. The basal Loyalhanna Member, a cross-bedded, arenaceous limestone or calcareous sandstone, is exposed along the highway. The middle red and green shales and siltstones are present, though mostly covered. The upper, abundantly fossiliferous limestone is exposed in the quarry.

Six different facies can be distinguished: (1) sandy, cross-bedded oolitic grainstone, (2) fossiliferous grainstone, (3) argillaceous and/or silty fossilferous packstone, (4) calcareous shale, (5) silty pelletal packstone, and (6) fossiliferous, pelletal packstone. The sandy, oolitic grainstone probably represents a shoreline-sand deposit. The energy level was high, with ooids forming and most of the mud being washed out. The fossiliferous grainstone was deposited on a shallow, open shelf, above wave base and within the photic zone. Energy level was moderate; muds were washed away, but fossils are mostly whole and not abraded. The biomicrite is extremely fossiliferous and burrowed with varying proportions of clay and silt. They too were probably deposited on a shallow, open shelf but below wave base. The environment was one of normal salinity, low energy, and good circulation. The calcareous shale formed due to terrigenous influxes into the carbonate environment. A shallow, low energy, near shore environment is suggested for this facies. The silty pelsparite was deposited in a somewhat restricted environment, perhaps lagoonal. Energy level was moderate. The biopelmicrite formed in clear, shallow waters with normal salinity and good circulation. A fairly low energy environment, below wave base, is indicated.

All of the facies present in the Greer section have been interpreted as relatively shallow-water environments. These findings are consistent with previous studies of the Greenbrier along the eastern outcrop belt.

BETH A. VOGT, and CHRISTINE NEBIOLO, Dept. of Biology, Allegheny College, Meadville, PA 16335.

Corn Mesophyll and Seedling Protoplast RNA Synthesis in the Presence and Absence of 5-Azacytidine.

5-Azacytidine (5-azaC), a nucleoside analog, has been shown to cause hypomethylation of eukaryotic DNA which is associated with activation of specific genes and cell differentiation. 5-azaC has also been shown to have a variety of cytotoxic effects on the eukaryotic cell including inhibition of RNA maturation, inhibition of DNA and protein synthesis, and polyribosome degradation. The effect of the analog on RNA synthesis has not been reproducible as studies have reported decreased synthesis, unaffected synthesis, and decreased then repidly increased synthesis. We have investigated the effect of 5-azaC on RNA synthesis in isolated protoplasts of corn mesophyll tissue and shoot tissue from corn seedlings. RNA synthesized by protoplasts was labeled over a 24-hour period with ^{3}H-uridine and counted in a liquid scintillation counter. The RNA synthesis rate of 5-azaC-treated mesophyll protoplasts was significantly higher than that of untreated mesophyll protoplasts. No significant difference was found between the RNA synthesis rates of treated and untreated seedling protoplasts. It is proposed that 5-azaC exerts an uncharacterized transcription-stimulating effect on the more stable mesophyll protoplasts. 5-azaC-induced hypomethylation is not considered as a possible explanation because methods employed were not sensitive enough to detect such small increases in synthesis rates as would be caused by hypomethylation of only several percent of cytosine residues in DNA. It is proposed that seedling protoplasts, on the other hand, show no significant increase in RNA synthesis rate because they are more sensitive to the cytotoxic effects of the analog which would counteract any transcription-stimulating effect.

LISA WHITE, WILLIAM C. KURYLA AND B. DAS SARMA, Department of Chemistry, West Virginia State College, Institute, W. Va. 25112.

Shelf-life of Prescription Drugs with Special References to the Anticancer Drug, Platinol.

Packaged materials sold for human consumption and capable of undergoing deterioration with time, are normally dated with an expiration date. This is routinely done for film, fresh fish and meat, and for prescription drugs. The Good Manufacturing Practice Regulations which specify requirements for expiration dating and for stability testing by Department of Health, Education, and Welfare, Food and Drug Administration, are not very logical and/or scientific in many instances. This procedure was termed "The Dating Game" at the Annual Meetings of Regulatory Affairs Professional Society indicating that the rules of this game are often less standardized compared to those of our popular national sports. Criteria for shelf-life of a prescription drug will be discussed with special reference to the chemical physico-chemical and bacteriological activities of an anticancer drug, Cisplatin.

next easily identifiable unit below the first occurrence of Callipteris which, in West Virginia, is about the horizon of the Upper Washington Limestone.

WILLIAM H. GILLESPIE, U.S.Geological Survey, 916 Churchill Circle, Charleston, WV 25314 and HERMANN W. PFEFFERKORN, Dept. of Geology, University of Pennsylvania, Philadelphia, PA 19104.
Plant fossils of the New River Gorge (Mississippian and Pennsylvanian)in West Virginia.

Ten years of collecting have shown that plant fossils are locally abundant in the New River Gorge and adjacent areas in strata ranging in age from Upper Mississippian into lower Middle Pennsylvanian.

The Upper Mississippian flora is characterized by Stigmaria stellata, Sphenophyllum tenerrimum, Sphenopteris elegans, S. launoitii, Lyginopteris fragilis, L. bermudensiformis, Calamites radiatus, Lepidodendron sp., Rhodeopteridium stachei, Sphenopteridium bifidum and Archaeopteridium tschermackei. This flora differs markedly from that of the overlying Lower Pennsylvanian Series which contains Neuropteris pocahontas, Sphenopteris pottsvillea, Karinopteris acuta, Alethopteris decurrens, Lepidodendron aculeatum, L. obovatum, L. dichotomum, Stigmaria ficoides, Lyginopteris hoeinghausii, Aulacotheca campbelli, Holcospermum maizeretense, Asterophyllites equisetiformis, and Sphenophyllum cuneifolium.

The flora of the lower Middle Pennsylvanian Series is found in the Kanawha Formation strata that cap the nearby hills. It contains among others, Sphenopteris schatzlarensis, Annularia radiata, Mariopteris muricata, Neuropteris gigantea and N. heterophylla.

Several plant fossils found during this study have proven to be long-ranging and may be found throughout the strata exposed in the Gorge. These include Asterophyllites longifolius, Mesocalamites suckowi, Calamites spp. and Cordaites spp.

A large number of the plant fossils identified during this investigation have proven to be identical or closely related to those found in similar-aged strata in other parts of the nation and world and, therefore, are useful for interbasinal and intercontinental correlation.

G. A. Jewell, Dept. of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506. Devonian and Mississippian Sand Bodies of East Central West Virginia and Their Associated Environments of Deposition.

Previous investigations and descriptions of Upper Devonian and Lower Mississippian strata of east central West Virginia are limited. Utilizing both subsurface and surface data the interval was studied to better understand its different environments of deposition.

The Upper Devonian and Lower Mississippian strata in the study area are made up of sandstone, shale, siltstone, conglomerate and thin

CORTLAND F. EBLE, West Virginia Geological and Economic Survey, Morgantown, WV 26507 and WILLIAM H. GILLESPIE, United States Geological Survey, 916 Churchill Circle Charleston, WV 25314. *Characteristic Small Spores of the Coalburg Coal in West Virginia*

Twelve samples of Coalburg coal collected from seven localities in Kanawha, Mingo, Boone and Wayne counties, West Virginia have been subjected to a palynological analysis in order to document the coal microflora. The small spore flora has been found to contain at least 25 genera represented by 70 species.

Statistical counts of 200 spores performed on each sample have shown *Lycospora* and *Laevigatosporites* to be the most abundant genera in the Coalburg coal. Other commonly occurring genera include *Calamospora*, *Densosporites*, *Triquitrites*, *Granulatisporites*, *Endosporites* and *Florinites*.

WILLIAM H. GILLESPIE, Dept. of Geology, West Virginia University and US Geological Survey, 916 Churchill Circle, Charleston, WV 25314. Plant compression fossils near geologic system boundaries in West Virginia.

Fossil plant compression floras have been collected from more than 350 locations in West Virginia. These floras change gradually with time and first occurrences, last occurrences and certain concurrent ranges characterize several biostratigraphic zones. Preliminary results of the ongoing studies also indicate that geologic system boundaries may be generally identified by the fossil plant assemblages found above and below them.

The Devonia Mississippian boundary is characterized on the Devonian side by Archaeopteris macilenta, A. halliana, and Rhacophyton ceratangium, although other plants often occur. This contrasts with the Lower Mississippian flora whose persistent members are various species of Lepidodendropsis, Triphyllopteris and Rhodea.

The Mississippian-Pennsylvanian boundary is also well marked, even in southern West Virginia where the uppermost member of the Mississippian Bluestone Formation intertongues with the lower sandstone Member of the Pocahontas Formation to form a gradational sequence. At least a dozen plants mark the Upper Mississippian, but the assemblage made up of Stigmaria stellata, Sphenophyllum tenerrimum, Sphenopteris elegans, and Lepidodendron veltheimi does not cross into the Pennsylvanian. This differs from the flora of the lowermost Pennsylvanian where Neuropteris pocahontas, N. smithi, Sphenopteris pottsvillea, Aneimites fertilis, A. pottsvillensis and Asterophyllites grandis are common.

Upper Pennsylvanian strata are characterized by dozens of species but Pecopteris arborescens, P. unita, P. polymorpha, Dicksonites leptophylla, Pseudomariopteris ribeyroni, Sphenophyllum oblongifolium, and S. angustifolium are nearly always present. The Permian boundary is, by definition of the International Carboniferous Congress, at the

RICHARD MORLEY, Dept. of Geology, West Virginia University, Morgantown, West Virginia 26506.
A new stereonet technique to analyze fracture geometry in folded rocks.

Small-scale structures related to folding may be classified based on their age, genetic, and geometric relationships to the folds. These relationships may be determined by field observations and analytical techniques using stereographic projections. If the orientation of structures is geometrically controlled by layering and the fold axis, the fractures may be classified according to three orthogonal axes which are related to these controls. This classification may be represented stereographically by a template of a single set of small circles for the orientations with the greatest symmetry. In the general case, the arrangement of the small circles is independent of axial orientation, and is defined for the case when bedding is horizontal and there is no plunge.

To determine if fracture orientations measured in a region are classifiable in terms of these geometric constraints, and hence were caused by the folding, the orientations have to be normalized. Normalization is achieved by plotting the orientations stereographically, rotating to remove plunge and layer dip, and rotating to a common regional fold axial orientation. If the normalized orientations plot in the positions of the small circles when the template is used, then the fractures are probably related to the fold geometry and are caused by the folding.

Application of this technique to the Oriskany Sandstone in the Valley and Ridge of West Virginia resulted in the assignment of observed fractures to two pre-folding sets and several discrete suites of structures related to bending and bedding-slip during folding processes.

R.L. RYAN and M.T. HEALD, Dept. of Geology and Geography, West Virginia University, Morgantown, WV 26506
Methods of Evaluating Leaching of Carbonate in Sandstones.

The porosity of many sandstones is now attributed to subsurface leaching of carbonate especially in the deeper formations where organics are believed to have produced acidic conditions. Carbonate that is present is considered to be residual from the leaching process. We are attempting to devise better methods for quantifying the proportion of secondary porosity resulting from carbonate leaching compared to primary porosity. Samples studied are from the Mt. Simon, Oriskany, Big Injun and Ravencliff sandstones in West Virginia and the Tuscaloosa Sandstone in Louisiana.

In order to determine which oversized pores are the result of leaching of carbonate rather than feldspar or other components, the size, shape and distribution of carbonate patches are being compared with pore geometry where porosity is primary. In some formations, our

coal beds making up portions of the Upper Devonian Chemung and Hampshire Formations, and the Lower Mississippian Pocono and Maccrady Formations.

The construction of three north-south and two east-west cross-sections utilizing the base-lined (relative method) gamma-ray logs facilitated the recognition of regionally mappable lithostratigraphic units.

The Caldwell and Gunpowder Ridge outcrops (Greenbrier County) and the Narrows outcrop (Giles County, Virginia) provided surface stratigraphic control in the eastern and southern part of the study area. Lithologic, sedimentologic and paleontologic data provided evidence for interpretations of environments of deposition. The correlation of these surface sections to nearby gamma-ray logs of the subsurface facilitates the interpretation of the mapped subsurface units.

Outcrop and subsurface interpretations indicate the interval studied exhibits offshore marine deposits (Lower-Middle Chemung Formation), nearshore marine shales, storm generated delta front sands, and bar deposits (Upper Chemung and Pocono Formations) and non-marine alluvial plain sediments (Hampshire and Maccrady Formations).

T.C. MAXWELL, Dept. of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506. Porosity Development in the Lockport Dolomite.

A complete cored section of the Middle Silurian Lockport Dolomite of eastern Kentucky was petrographically studied for paleo-environmental and diagenetic interpretations. The core was taken from a gas-producing well in Johnson County where the Lockport is 85 feet thick. Macroscopic analysis of the slabbed core revealed the presence of five distinct lithologies. Proceeding upsection from the contact with the underlying Keefer Sandstone, these lithologic units are 1) an extensively burrowed and fossiliferous, medium to dark gray, pelletal wackestone (restricted shelf), 2) a light gray, dolomitized stromatoporoid-coral-pelmatozoan packstone-wackestone (open shelf), 3) a light gray to cream-colored quartz siltstone (coastal sand), 4) a medium gray, partly dolomitized oolitic packstone-grainstone (shoal), and 5) a light to medium gray, laminated, dolomitized mudstone (tidal flat). The upper contact with the Salina Group is gradational and was picked primarily on the basis of the gamma-ray log.

Good porosity occurs throughout the section, particularly in the oolitic facies and the stromatoporoid-coral-pelmatozoan facies. Direct log measurements indicate porosities in the 4-5% range. Several different kinds of primary and secondary porosity are present, including intergranular, intercrystalline dolomitic porosity, fracture porosity, and vuggy (solution) porosity. Of these, the most prominent are intercrystalline dolomitic and vuggy porosity. Continuing research on the diagenetic processes responsible for this porosity development coupled with a synthesis of other available sedimentary data, should facilitate future exploration strategy in the Appalachian Basin.

Geology-Mining

SHERRY A. BRAZZLE and A.C. DONALDSON, Dept. of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506. Stratigraphy of the Sewickley-Waynesburg Coal Interval in Northwestern Monongalia County, West Virginia and Southwestern Greene County, Pennsylvania.

Detailed stratigraphy for the Sewickley-Waynesburg coal interval (Monongahela Group) has been correlated for a 41 square mile area approximately 5 miles northwest of Blacksville, West Virginia. Data for this investigation were obtained from 80 rotary and core holes on a one mile drilling density. In addition, regional studies conducted previously in the area have been used to establish the proper stratigraphic context.

The stratigraphic interval, which ranges from 208 to 264 feet in thickness is characterized by vertical repetitions of sandstone, siltstone, shale, claystone, and lacustrine limestone. Although these repetitions are somewhat cyclic, a general upward increase in clastic sedimentation is indicated. Due to their relative continuity and persistence throughout the area, correlations have been based upon the Sewickley coal, Benwood limestone, Gilboy sandstone, and the Waynesburg coal. Cross-sections reveal mosiac depositional patterns created by intertonguing and intergrading of the lithologies; therefore, areal variations and principal depositional patterns are illustrated by lithofacies maps of selected sub-intervals. From this data, the Sewickley-Waynesburg coal interval is interpreted to have been deposited in a large cratonic lake in which deltaic and interdeltaic sediments increasingly replaced the lake facies.

Stratigraphic analysis of the interval indicates that distribution of the facies has been controlled by tectonic subsidence, differential compaction and sedimentation, clastic supply and eustatic sea level changes.

ALAN D. SMITH, Coal Mining Administration, College of Business, Eastern Kentucky University, Richmond KY 40475. Hypothesis testing and model comparisons of trend surfaces and three-dimensional modeling techniques applied to mapping selected roof fall characteristics in a West Virginia coal mine.

Cost-sensitive mine planning systems assume that the physical and economic conditions that will have the greatest impact on cost and coal quality can be predicted accurately enough to assist mine planners in making decisions. Several such factors, namely vertical height of mine opening, mine roof span in or adjacent to fall area, structure contour of maximum mine roof height, and height, from mine roof edge, to second and third rock break horizon of roof strata, extremely important parameters in forecasting potential ground control problems, were measured and mapped for 21 recent mine roof falls in a West Virginia coal mine. The coal mine is mining in a nine-foot, Upper Free-

study indicates that the voids within feldspar and quartz originating from straight dissolution are much smaller than voids resulting from the leaching of carbonate that had partially replaced the feldspar and quartz. Carbonate has been found to partially replace some coatings so that the condition of coatings gives an indication of the former extent of carbonate in leached samples. The modification of primary carbonate in such forms as shells and ooids is being compared in leached and unleached samples. Chert grains have been found to be particularly useful because conspicuous irregularities at grain margins result from carbonate replacement. Even if quartz grows after carbonate leaching, the preexisting irregularities can be recognized. Under the scanning electron microscope, subtle, unique features are observed on many grain surfaces where carbonate has been artifically leached compared to unleached samples. Our preliminary studies indicate that leaching may be minor and that much of the porosity is primary rather than secondary.

DAVID P. SCHULTZ, and WILLIAM M. DUNNE, Dept. of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506. Deformation in the Hopeville Anticline of Pendleton County, West Virginia.

The Hopeville anticline and syncline are first-order parasitic folds in the northwestern limb of the Wills Mountain anticline in Grant and Pendleton Counties, West Virginia. A structural investigation of these folds was conducted at a roadcut in Pendleton County, just south of the Grant-Pendleton county line. Stratigraphic units at this exposure are Siluro-Devonian in age and range upwards from the upper Big Mountain Shale Member to the lower New Scotland Formation. Mechanically, the stratigraphy has acted as three litho-structural units during deformation.

At the scale of the roadcut, the Hopeville anticline and syncline are first-order folds. Two marco-scale thrusts are present and also meso-scale contraction faults within the Hopeville syncline. One macro-scale thrust, the Hopeville thrust, transects the Hopeville anticline. By using palinspastic restorations, it was established that the fault is older than the fold. Further, when the sequence was restored to an undeformed state, it was determined that this portion of the Hopeville thrust was a ramp which cut upsection through the middle litho-structural unit. This conclusion is consistent with the observation that the thrust has a small rootless anticline in the hanging wall. Thus, the Hopeville anticline consists of two anticlines of differing age. The older, rootless anticline which formed during displacement along the Hopeville thrusts accounts for less than 18% of the total fold-amplitude. Producing more than 82% of the total fold-amplitude, the younger fold forming the core of the Hopeville anticline probably occurred in response to displacement along a ramp on an underlying, younger blind thrust.

roof beds, further study is recommended to core in adjacent stable areas with no recent record of ground control problems, under similar conditions, to determine if the lithologic profiles found in this study are unique to potential roof fall areas.

J.N. STAFFORD, Dept. of Geology and Geography, West Virginia University, Morgantown, WV 26506
Geologic Controls in Gas Production from the Benson Sand in a part of Randolph County, W.Va.

A detailed subsurface study of the Benson gas sand (Upper Devonian) in part of the Cassity gas field of western Randolph County, West Virginia, delineated east-west channel trends contiguous with Benson channels found to the west. Separate sand isoliths were constructed for the upper Benson, lower Benson and Benson-Elk intervals using a relative baseline method that reduces errors in estimating sand thickness resulting from the common miscalibration of the API scale. Upper and lower Benson sand isoliths demonstrate general agreement with Cheema's Benson depo-model, but structural contours on the Benson of this study do not suggest the presence of "compaction-generated structural highs". Apparent thickening within the Benson-Elk interval does not appear to be depositional in character, as thick trends parallel several small thrusts and back-thrusts that are present in the study area. Benson stratigraphy appears to be an important control on gas production. Potential structural controls on production cannot be adequately evaluated due to a lack of quality production data.

John H. Wolf, Department of Physical Science, West Virginia University, Morgantown, WV 26506
An Investigation of Ground Water Chemistry as an Exploration Tool for Gas in Ritchie County, West Virginia

Ground water from drilled wells in the areas surrounding Harrisville, Cairo, and Ellenboro in Ritchie County were sampled on a random grid. Aquifer units are found in the Dunkard and Monongahela Groups.

Water samples were analyzed for temperature, pH, specific conductance, bicarbonate, total hardness, dissolved iron, sodium, chloride, nitrate, sulfate, calcium, magnesium, and hydrogen sulfide. A program calculating the saturation index of calcite was also run. The concentrations of the different chemical parameters found in the water wells were graphically and statistically compared with final open flow gas production at distances ranging from one tenth to five tenths of a kilometer.

Preliminary analyzation indicates trends are developed between bicarbonate, sodium, and the saturation index of calcite when compared with local gas well yield. Directional trends also appear to be developed for some parameters. Reasons for the correlations are proposed to be due to gas migration up through subsurface fractures in the bedrock to the ground water where chemical changes take place.

port seam. The major research and analysis tools used in the present study were polynomial-trend surface analyses, hypothesis testing and mode comparisons of trend surfaces, and three dimensional models generated from commercially available computer software, via the incremental drum plotter.

The mean thickness of the vertical height of mine opening was 2.70 m, average mine roof span in or adjacent to fall area was 5.59 m, maximum roof height averaged 2.862 above the roof edge, and the means for the second and third heights, above the roof top to the rock break horizons of the roof falls studied were 1.83 and 0.65 meters, respectively. Traditional ANOVA techniques and hypothesis testing and model comparisons of trend surfaces delineated the third-order trend surface (R^2 = 0.7100) for vertical height of mine opening, the second-degree surface (R^2 = 0.5864) for mine roof span in or adjacent to fall area, and the fourth-order polynomial trend surface for the height to second rock break horizon of roof strata in the mine roof fall as the best predictive models. However, no trend surface accounted for enough explained variance in predicting maximum mine roof fall height and third horizon, measure from roof top, as a function of location in the mine site. In addition, three-dimentional, graphical displays of structure contour of most of the parameters were generated to allow the potential user to portray selected distributions in order to plan preventative measures in future ground control plans.

ALAN D. SMITH, Coal Mining Administration, College of Business, Eastern Kentucky University, Richmond KY 40475. Lithologic characteristics of immediate mine roof of roof falls in selected coal mines of Eastern Kentucky.

The first four immediate mine bed characteristics of 250 roof falls in 5 different coal mines located in Pike, Martin, and Floyd Counties of the Eastern Kentucky Coalfield were investigated to profile the basic lithologies and their associated thickness. The mine roof falls occurred in the Peach Orchard, Pond Creek, Broas, and Fireclay coal seams.

Most of the mine roof falls were associated with the Pond Creek coal seam, had evidence of cracks or joints in the roof before the actual fall, and relatively thin immediate layers (0.1 to 3.9 inches). The first immediate roof bed was characterized by predominately shales, laminated shales, and black shales (50 percent) and coal top, including bone coal (28.4 percent). Thicknesses of the first layer were commonly in the 2 to 4 and 10 to 70 inches range, with 2 to 4 inches most frequent. The second immediate roof bed was also characterized by a predominance of shales (33 percent), coal (19 percent), however, these figures may be higher due to relatively large numbers of missing or unknown cases (38 percent). The vast majority of falls (67 percent, once adjusted for missing cases) had second immediate layers of thickness less than 20 inches. Similar roof beds were found in the third and fourth immediate roof but, due to the difficulty in access to measure these parameters in actual roof falls, a relatively large percentage of missing cases was found.

Although the first step in preventing roof falls is to characterize the basic lithologic and geologic characteristics of the immediate

Biology-Sociology-Psychology

CAROL J. FALKENHAYN AND E.C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, WV. Relationships Among Air Quality, Medical Variables, Drinking Water, Natural Waters, and Disability Parameters in the Counties of West Virginia.

Factor anaylses were completed on a number of air and water quality variables, medical resource and patient variables, and several disability rates for the 55 counties of West Virginia. Several important factors were identified in each of the three groups. The most important factors were: air pollution emitters, medical resources, flow through the water treatment plants, acid drainage water, and learning/behavioral/retardation disabilities. Indices constructed from these five factors were correlated and their degree of relationship determined; e.g., the air pollution emitters index was highly correlated (negatively) to certain disabilities, and was also highly correlated to health care resources. Whereas there was a negative association with certain disabilities and health care resources. Other indices showed equally significant associations.

PETER C. BACIU AND E.C. KELLER, JR., Dept. of Biology, West Virginia University, Morgantown, WV, 26506. Relationships Among Cancer Rates and Drinking Water, Economic, and Air Quality Statistics.

Correlation and factor analyses were completed on West Virginia County cancer rate data with county drinking water, economic, and air quality statistics. Using factor analyses major factors were identified from the various data bases. Correlations were computed using indices constructed from the significant component variables of the major factors. The findings showed that those counties characterized by high flows in their drinking water plants had high rates of digestive cancers in males (the major cancer factor in West Virginia) and vice versa. Other factors such as the amount of durable goods sold, and county population size also showed high associations with digestive cancers in males.

LINDA M. REINERT and JOHN H. HULL, Dept. of Psychology, Bethany College, Bethany, West Virginia 26032. The thrill of victory -- for males only.

Twenty female and 20 male subjects initially rated their ability to do general intellectual tasks, and to do a specific digit memory task. All subjects then completed a digit memory task, trying to

Physics-Engineering

HAROLD V. FAIRBANKS, Dept. of Chemical Engineering, West Virginia University, Morgantown, West Virginia 26506-6101. Influence of Ultrasound on Material Processing.

The influence of adding ultrasound during the processing of materials may be considered catalytic. That is, the sonic radiation increases the rate for a given process to reach equilibrium. The influence of this catalytic effect by sonic radiation is quite significant when the normal rate toward equilibrium is very slow. The mechanism by which ultrasound produces the catalytic effect differs with the various process systems.

This paper summarizes the major results of several exploratory studies which made use of ultrasound during processing of materials at West Virginia University. Ultrasound having a frequency of 20 kHz with sound intensities up to 170 dB was introduced into processes which included both metallic and non-metallic materials.

For metals, the areas studied included: solidification, recrystallization, heat treating, heat transfer and drilling of metals. For non-metals the areas studied included: molding of polymer powders, filtration, drying of temperature sensitive materials, and the effect of ultrasound on the adherence of molten glass to heated metal.

JOSEPH E. WIEST, Dept. of Engineering and Physics, West Virginia Wesleyan College, Buckhannon, West Virginia 26201. A Laboratory Course on Lasers for the Advanced Undergraduate Student.

While the development of lasers has been rapid and extensive and the laser has opened up new opportunities for research in the sciences, few undergraduate institutions offer courses on lasers. I have developed a laboratory course on lasers at West Virginia Wesleyan College which leads students to explore the optical background, the design, the parameter measurements, and the applications of lasers. The course is a one-semester course that meets for 3 hours each week; it has been taught for three years now. The laboratory has been designed at a reasonable cost, using a combination of in-house built equipment and commercially-bought equipment. The group of lasers that is used consists of the helium-neon laser, the ruby laser, the nitrogen laser, the solid-state diode laser, and two different types of tunable dye lasers. The experiments designed for the course are entitled: The Monochrometer and Optical Spectra, The Helium-neon Laser and Quantum Optics, The Ruby Laser and Non-linear Optics, The Diode Laser and Fiber Optics, The Nitrogen Laser: Design and Parameter Measurements, The Flashlamp-pumped Tunable Dye Laser: Design and Characteristics, and The Laser-pumped Tunable Dye Laser and Atomic Excitation. Both equipment design and experimental detail will be presented.

SCOTT D. FLINN and JEFFREY D. CROSS, Psychology Department, Allegheny College, Meadville, PA 16335. Conspecific Odors in the Degu and Implications for Commonality.

Pheromones are a class of odors which elicit a reaction from conspecifics. A pheromone studied extensively in rats is one which the rats release when they encounter food (R-reward trial) or no food (N-nonreward trial) at the end of a runway. The rats are placed in squads, and the first rat, called the donor, is placed in the start area. The rat runs to the goal area where it either receives the R or N trial. The rats in the squad which follow the donor, called subjects, receive the same stimulus as the donor. A subject placed in a runway runs faster to the goal area if the conspecific which ran before it received an R trial, and it runs slower if the donor received an N trial. Colonial species such as the rat, and several strains of Mus musculus, have been shown to excrete some type of odor when exposed to the R and N trials. However, noncolonial white-footed mice did not show differential responding. Since odors would be helpful to colonial species by facilitating communication, colonial animals should run faster on R trials than N trials while noncolonial animals should not. In this experiment, Degus, which are noncolonial rodents from Chile, were tested to see if they showed evidence of an odor of reward and nonreward by their run speeds. As was hypothesized, the noncolonial Degus did not show significantly different speeds between R and N trials.

RICHARD J. ZAWLOCKI, RANJIT K. MAJUMDER, and JOSEPH B. MORIARTY, West Virginia Rehabilitation Research and Training Center, West Virginia University, Morgantown West Virginia 26506. Reliability and Validity Findings on the Preliminary Diagnostic Questionnaire (PDQ).

The Preliminary Diagnostic Questionnaire (PDQ) is an evaluation instrument designed to provide information on the functional capacities of disabled people in relation to their employability. Over 3,000 vocational rehabilitation (VR) clients have been administered the PDQ in at least 35 states. Several procedures have been used to assess the reliability and validity of the PDQ. Samples employed in these procedures were fairly representative of the general VR population. PDQ scales appear stable over time and exhibit a relatively high degree of internal consistency, i.e., significant test/retest and interitem reliability coefficients. Criterion-related validity of several relevant PDQ scales was demonstrated by significant correlation coefficients with certain Wechsler Adult Intelligence Scale (WAIS) scores. Examination of construct validity by a factor analysis procedure yielded three factors (cognitive functioning, motivational and emotional states, and physical functioning) with significantly high loadings. These factors were associated with the appropriate corresponding PDQ scales. Additional analyses are being conducted on the PDQ by staff of the West Virginia Rehabilitation Research and Training Center.

recall increasingly long strings of one-digit numbers. Half of the males and females were told, regardless of actual performance, that they had done better than their age and sex norms ("winners"); half were told they had done poorer than their age and sex norms ("losers").

Major findings were: 1 -- males initially gave significantly higher ratings of their ability to do well on intellectual tasks, although females and males did not differ initially on their estimates of how they would do on a digit memory task; 2 -- male "winners" gave significantly higher estimates of how well they thought they would do on a followup digit memory task, compared to their initial performance on the task, than either female "winners" or male or female "losers".

JOHN R. WARNER, JR., Dept. of Sociology and Anthropology, West Virginia Wesleyan College, Buckhannon, WV 26201. Disregarding Rural Crime.

The notable absence of criminological research in rural areas has been discussed parenthetically in several recent studies of rural crime. Most of the studies of crime have been carried out in urban areas, and most theories of crime and delinquency point, in one way or another, to the center of the city as the locus of the problem. Ecological theories, cartographical theories, opportunity theories, cultural deviance theories, differential association and anomie theories all suggest that cities are criminogenic, and that rural areas are, conversely, the very opposite.

This urban bias in etiological theories has been explained as a function of the location of universities in which criminologists do their work; as a function of governmental grants given to study urban problems; as a function of the rural home life of early criminologists, and as a function of official crime reports which indicate that crime rates are indeed higher in urban than in rural areas.

In this paper we will argue that while there is some truth in each of the explanations listed above, there is a deeper source of that urban bias which has left almost untouched the study of crime in rural areas. That source is a structure of thought problem which permeates all sociological and criminological thinking. That structure of thought problem is the Gemeinschaft/Gesellschaft paradigm which rules all early sociological theory and which denies valid existence to Gemeinschaft-type social structures. Guided (often unknowingly) by that paradigm, students of social disorder disregard rural life as inconsequential.

This paper is the fourth in a series of rural crime studies presented by this author before the West Virginia Academy of Science.

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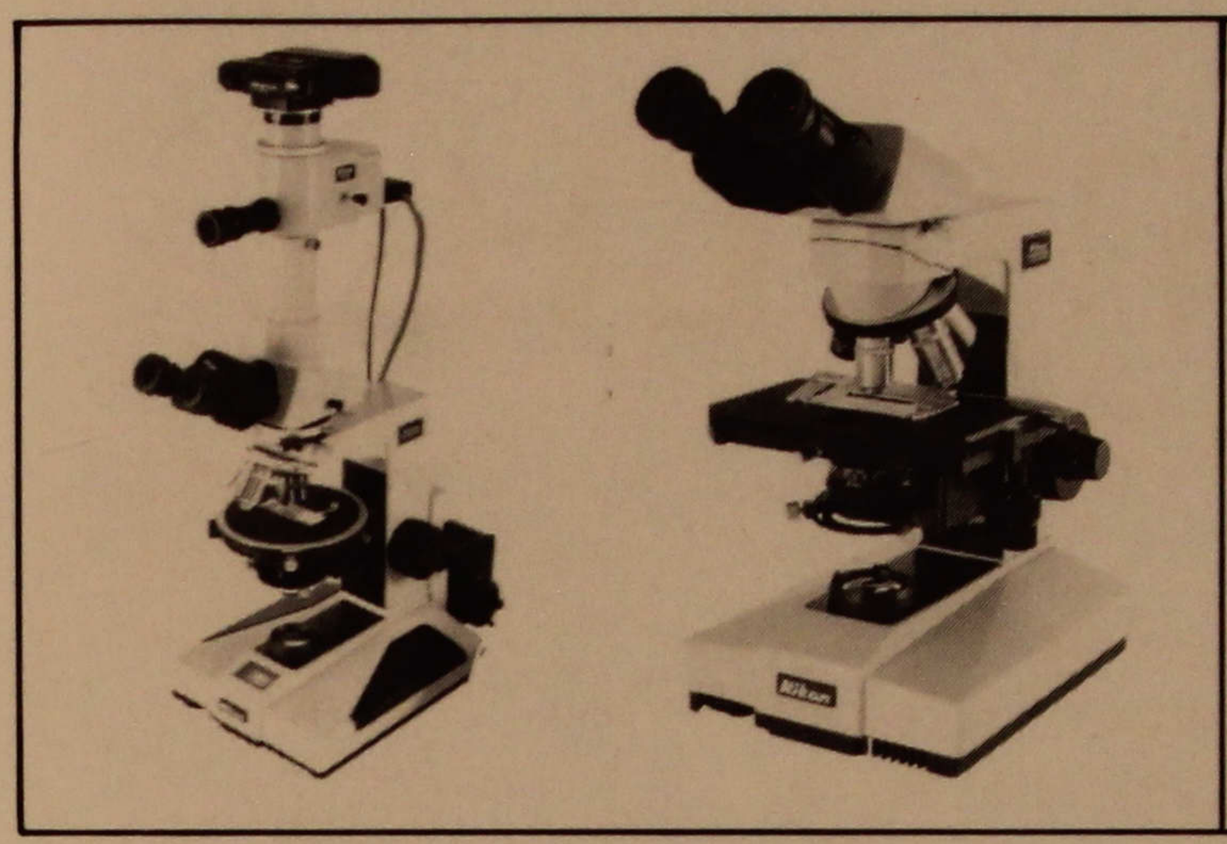

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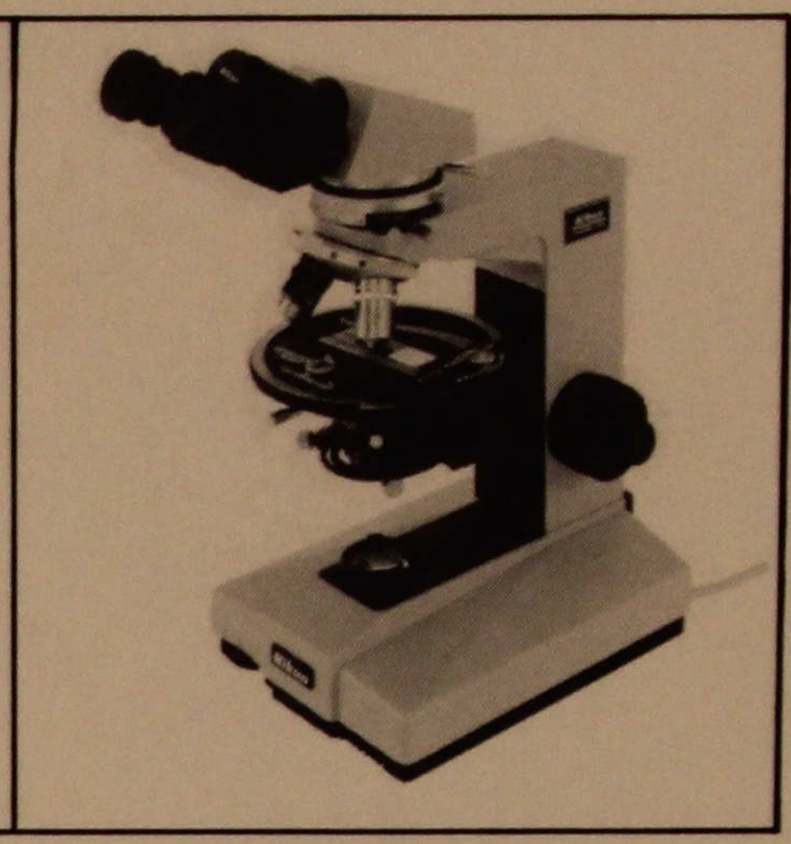

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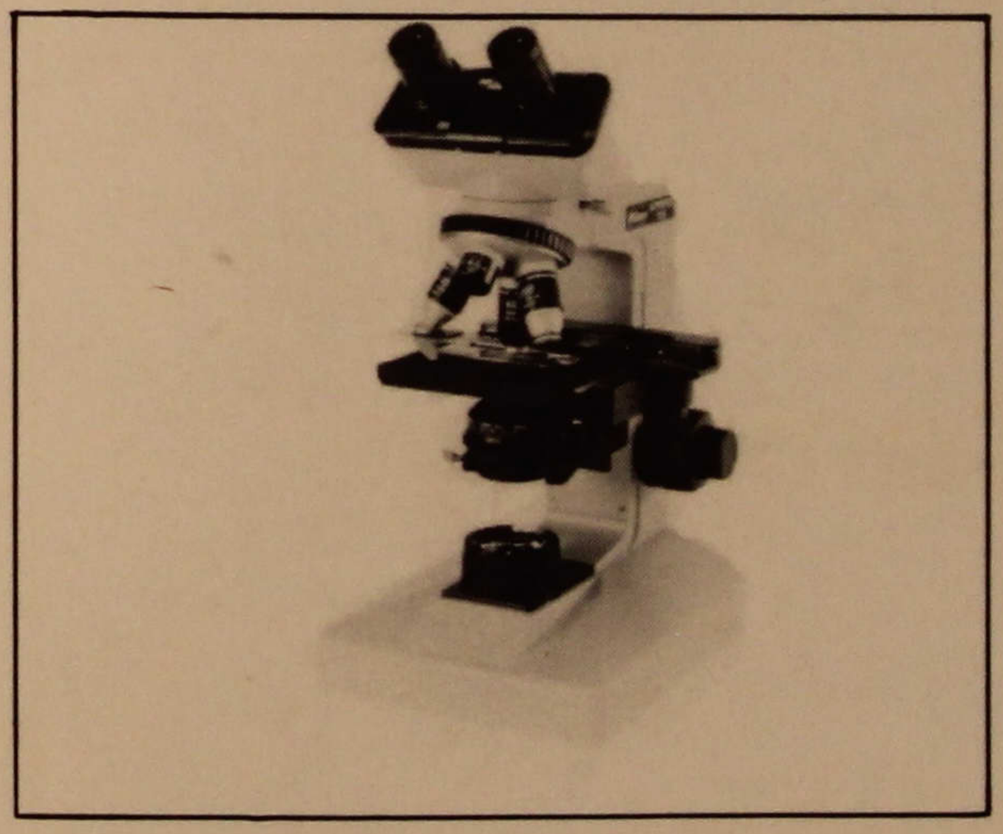

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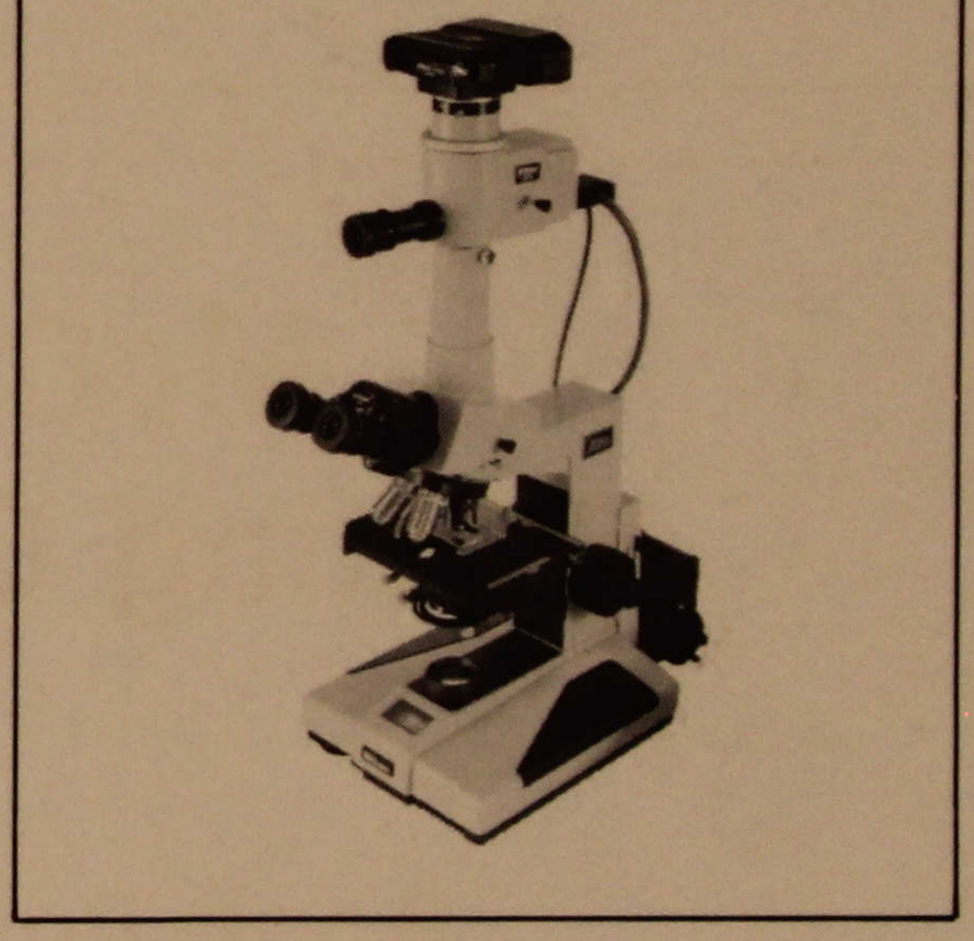

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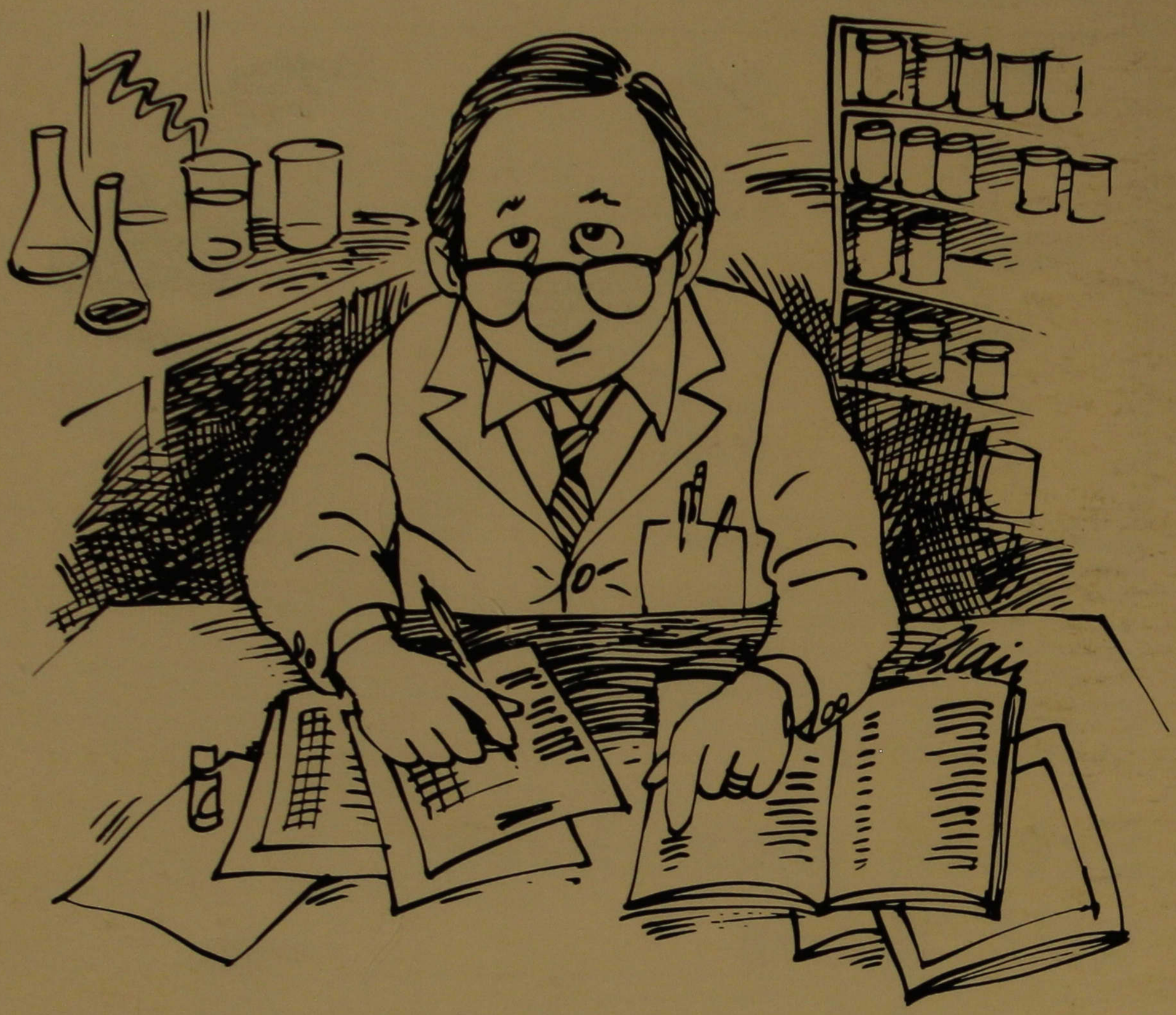

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