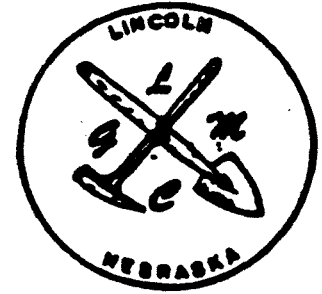


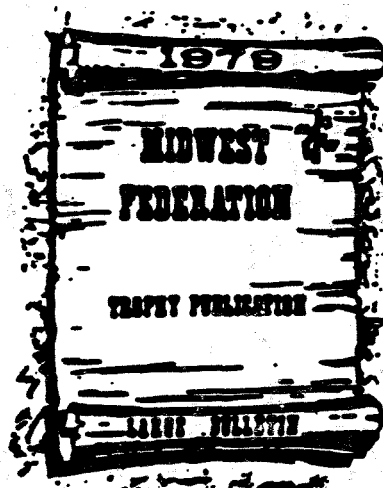
THE PICK & SHOVEL



November
1987

In this issue

Nominating Committee Report
CHRISTMAS PARTY
Recommended Polishes



OFFICIAL PUBLICATION OF

Lincoln Gem and Mineral Club, Inc.

P. O. Box 5342

Lincoln, Nebraska 68505

LINCOLN GEM AND MINERAL CLUB, INC.
P.O. BOX 5342, LINCOLN, NE 68505-0342

The purpose of this corporation shall be to study, promote an interest in, and disseminate knowledge of lapidary and various earth sciences including but not necessarily limited to geology, paleontology, and mineralogy. It shall be a particular purpose of the corporation to provide education in these fields to its members and the general public, particularly youth and student groups.

MEMBER: American Federation of Mineralogical Societies (AFMS)
Midwest Federation of Mineralogical and Geological Societies (MWF)
Nebraska Association of Earth Science Clubs, Inc. (NAOESCI)
Nebraska Academy of Sciences (NAS) (Life Membership)
Friends of the Museum

Regular Meetings: 4th Saturday of the month, September thru May; 7:30 P.M.
At Nebraska Center, 33rd & Holdrege

1987 ELECTED OFFICERS:

| | | |
|---------------------------------|----------------------------------|----------|
| President.....Kevin Schwartman | 1134 West Avon Ln Lincoln, 68505 | 464-3059 |
| 1st Vice Pres.....Janet Wright | 3715 S. 33rd St. Lincoln, 68506 | 488-1884 |
| 2nd Vice Pres.....Jim Parks | 2435 S. 19th St. Lincoln, 68502 | 476-6798 |
| Secretary.....Vera Lyman | 420 N. 56th St. Lincoln, 68504 | 464-6089 |
| Treasurer.....Phyllis Parks | 2435 S. 19th St. Lincoln, 68502 | 476-6798 |
| Board Member.....Fred Holbert | 2822 S. 13th St. Lincoln, 68502 | 423-5639 |
| Board Member.....Shirley Rockel | 1134 West Avon Ln Lincoln, 68505 | 464-3059 |
| Board Member.....Tom Simmons | 2970 South St. Lincoln, 68502 | 488-1619 |
| Board Member.....Marie Taylor | 910 New Hampshire Lincoln, 68508 | 476-3707 |

NOMINATING COMMITTEE -- 3 years: Dave Heffelbower, Wm. Rockel
2 years: Irl Everett, Claude Scott
1 year: Vera Lyman, John Lewis
Linda Parks, Chairperson

LONG RANGE PLANNING AND BY-LAWS COMMITTEE:

1 year - Jim Taylor, Irl Everett 3 years - Bob Wright, Linda Parks
2 years - Claude Scott, Phyllis Parks Linda Parks, Chairperson

STANDING COMMITTEE CHAIRPEOPLE:

| | |
|-----------------------------------|---------------------------------------|
| Calling.....Phyllis Parks | Membership.....Shirley Rockel |
| Education.....Roger Pabian | MWF Liaison.....Marie Taylor |
| Field Trips..... | Programs.....Janet Wright |
| Historian.....John & Lillie Lewis | Scholarships.....Marie Taylor |
| Hospitality.....Ed Ridge | Xmas Party.....Marie & Susan Taylor |
| Housing/Property.....Claude Scott | 1987 Rockhound/Yr....Dave Heffelbower |
| Jr. Activities.....Janet Wright | 1987 Annual Show.....Jim Marburger |
| Librarian.....Jim Parks | 1988 Annual Show..... Roger Pabian |

AUDITING COMMITTEE 1986.....Lois Hunt, Bruce Simon
Shirley Rockel, Chairperson
Phyllis Parks, Treasurer

PICK & SHOVEL STAFF:

Editors.....Board of Directors
Co-ordinator...Vera Lyman, 420 N. 56 st. Lincoln, NE 68504 (NAOESCI Reporter)
Circulation...Dave Heffelbower
Rays of Sunshine..Gail Clare Scott
Reporters....."CLUB MEMBERS"

DEADLINE: 1st of Month of Issue. Original articles may be reprinted if credit is given the author and THE PICK & SHOVEL and a copy of the publication is sent to the Editor.

CALENDAR PAGE

| | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|------|----|----|----|----|----|----|
| November | | | | | | | 1987 | | | | | | |
| S | M | T | W | T | F | S | S | M | T | W | T | F | S |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | | | | | | | | | | | | |

NOVEMBER MEETING: Saturday, November 21, 1987, 7:30 P. M.**
Nebraska Center, 33rd & Holdrege



** (If Okla./Neb. Game is televised 3 PM instead of 1 PM-business meeting will start at 8:00 PM)

BUSINESS: Election of 1988 officers and board of directors.

PROGRAM: Anticipate an interesting one.

JUNIOR MEETING: We'll be calling with details.



CHRISTMAS DINNER: Saturday, December 5, 1987, 6:00 P. M.
Nebraska Center, Columbus Room -Details elsewhere.

| | | | | | | |
|----------|----|----|----|----|----|----|
| DECEMBER | | | | | | |
| S | M | T | W | T | F | S |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

DECEMBER BOARD MEETING: Monday, Dec. 7, 1987, 7:30 P.M.
American Charter, 40th & South

JANUARY 1988 MEETING: 5th Saturday, January 30, 1988 - 10th Annual Indoor Swap
Nebraska Center 33rd & Holdrege (More in December.)

* * * * *

SHOWS & SWAPS FOR YOUR NEW CALENDAR

- Nov. 20-22 REGIONAL SHOW South Central Gem & Min. Federation, Austin, Texas
- Jan. 30, 1988 SWAP LGMC's Annual Indoor-Details later.
- March 19-20, 1988 SHOW Lincoln Gem & Mineral Club, 30th show, Lincoln, NE
PERSHING AUDITORIUM, 226 Centennial Mall South (15th St.)

Regional Show Schedule 1988

| CALIFORNIA | EASTERN | MIDWEST | NORTHWEST | ROCKY MOUNTAIN | SOUTH CENTRAL |
|------------------------------|---------|--------------------------|-----------------------------|---------------------------|------------------------------|
| Costa Mesa, CA Aug. 26-28 | | Macomb, IL July 14-17 | Kennewick, WA Sept. 9-11 | Bismark, ND June 17-19 | Shreveport, LA Aug. 11-14 |



Yes!! It's that time of year again when we reaffirm our continuing involvement with 'Lincoln Gem & Mineral Club, Inc.' by paying our 1988 DUES; getting to the November meeting; voting for the people who will plan and schedule activities for the coming year; and if possible by volunteering to assist in those activities.

DUES ARE DUE BY JANUARY 1, 1988. They will become delinquent January 31, 1988, after which they will require a reinstatement fee of \$1.00 each family. Dues structure is on the inside of the back cover of each Pick & Shovel. This year we would like to collect \$2.00 from each family as you pay your dues to insure that you continue receiving 'The Gem Palette', publication of the Nebraska State Association. For several years the club has paid for members to receive this bi-monthly Rockhound publication and hope you have all enjoyed it. Monies for your subscriptions to The Gem Palette must be sent to the association by January 1 so please pay your dues and sub this month or in December.

Remember you may mail your checks to the club address, P. O. Box 5342, Lincoln, NE 68505, attention the treasurer or bring to November meeting or December Christmas Dinner, and be certain to include \$2.00 per family for Gem Palette.

Thanks for your cooperation! and I'm really looking forward to a busy and active year with all of you.

Sincerely, Phyllis Parks

PRESIDENT'S MESSAGE

Hello again,

I'd like to thank all of you who came to the Halloween party last month, especially those who came in costume. We had an excellent turnout of both junior and senior club members.

It's time once again to vote for next year's officers and board members. We will need at least as good a turnout for the November meeting as we had for the October meeting. (if not better) Our November meeting will be on the 21st which, as most of you probably know, is also the same day as the Oklahoma-Nebraska game.

So please try to come to the meeting if you possibly can, we will need all the voters we can get for the election. Have a good month and we will see you the 21st!

Kevin Schwartzman

P.S. Don't forget to cheer on "Big Red" during the game.

* * * * *

NOMINATING COMMITTEE MEETING: September 22, 1987 7:00 P.M.
American Charter Bldg. 40th & Shouth Sts.

Members present: Claude Scott, Chairman
Vera Lyman, Irl Everett, Dave Heffelbower

Nominations for 1988 officers are as follows:

| | |
|----------------|-------------------|
| President: | Kevin Schwartzman |
| 1st Vice: | Fred Holbert |
| 2nd Vice: | Jim Parks |
| Secretary: | Vera Lyman |
| Treasurer: | Phyllis Parks |
| Board Members: | Marie Taylor |
| | Shirley Rockel |
| | Tom Simmons |
| | Gerald Moore |

Nominating committee recommends that Long-Range Planning and By-Laws committee members stay with present members since Kevin Schwartzman is staying on as president.

Nominating committee recommends that Long-Range Planning and By-Laws committee meet for suggested changes in By-Laws in the very near future.

Respectfully submitted,

Nominating Committee
Claude Scott, Chairman

P.S. At the September General Meeting nominations were called for by the President from the Floor. The following were added, as follows:

Nomination for Board Member: Dave Heffelbower
(by Billie Heffelbower)

"SMALL RAYS OF SUNSHINE"

We have heard (via the grapevine) that Mr. Olson had been ill, but is feeling fine now. Keep healthy, Mr. Olson.

- - - - -

Adeline E. Nolde was informed that November 6, 1987 would be the time for making the presentations of Life Memberships to several members of the Colorado Mineral Society. It was anticipated that she might be there, so the gold Life Membership identification card and the gold Life Membership badge with the Colorado Society insignia, her name, and the words "Life Member" engraved on it were sent to her, much to her surprise.

Congratulations, Adeline!

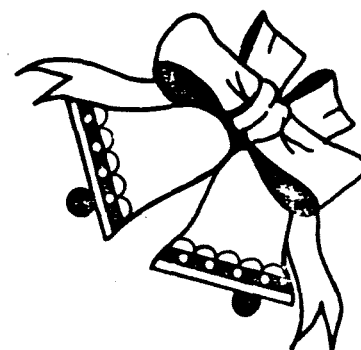
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"CHRISTMAS PARTY"

Our annual Christmas Party will be held on
December 5, 1987, 6:00 P.M.
Nebraska Center, 33rd & Holdrege, Columbus Rm

MENU

- Fried Chicken, Scalloped Potatoes
- Tossed Salad, Corn
- Strawberry Shortcake
- Roll & Butter
- Coffee or Tea



Price = \$ 8.00 per person

Please get your reservations and money to Phyllis Parks by December 1st.

MAIL TO: P.O. Box 5342 Lincoln, NE 68505-0342

* * * * *

THE ROCK CLUB BULLETIN EDITOR

by George "Chic" Cihacek

As an editor of fourteen years, I often wonder why I've held on to this job so long, or why I even try to put out a club bulletin which sometimes goes unread. Some even have suggested I have rocks in my head. In my search for an answer, it finally dawned on me that at sometime I must have realized how rewarding it can be. Oh, sure, we have our problems. We have deadlines to meet. There is material to assemble and new members to greet. We continually beg our members for an article or two, so their field trips and vacations may be made known to you. We read exchanges thoroughly in hopes that we will find an article just the size to fill the space we have in mind. We also worry constantly that our bulletin's not late-- that our members won't miss a show or will not know the date. But take heart, you novice editors, these worries are not bad when you realize it is the best job you ever had. Because, for every ounce of effort it may require from you, you'll get back a pound of happiness, and in some cases, two. A word of appreciation you will find is ample pay for a job you learn to like each and every day. Take these words as Gospel from one who knows right well that he will still be editor until it snows in Hell!

(This was written for the Editors Breakfast in Oklahoma City, June 14, 1987)

Via AFMS NEWSLETTER, Sept. 1987

RECOMMENDED POLISHES

CMO=Cerium Oxide TO=Tin Oxide LA=Linde-A DIA=Diamond CHO=Chrome Oxide

| | CMO | TO | LA | DIA | CHO | | CMO | TO | LA | DIA | CHO |
|--------------|-----|----|----|-----|-----|------------------|-----|----|----|-----|-----|
| ACTINOLITE | | X | | | | LABRADORITE | | X | | | X |
| AGATE | X | X | | | | LAPIS LAZULI | | X | X | | X |
| ALABASTER | | X | | | | LIMESTONE | X | X | X | | X |
| AMAZONITE | | X | | | | LAPIDOLITE | | | | | X |
| AMBER | | X | | | | MALACHITE | | X | X | | X |
| AMBLYGONITE | | X | | | | MOONSTONE | | X | | | |
| ANDALUCITE | | X | | | | NEPHRITE | | X | X | | X |
| APATITE | | | X | | X | OBSIDIAN | | X | | | X |
| AVENTURINE | | X | | | | ONYX | X | X | | | X |
| AZURITE | | X | | | X | OPAL | X | X | | | |
| APOPHYLLITE | | | | | X | PERIDOT | | X | X | X | |
| ARAGONITE | | | | | X | PETRIFIED WOOD | X | X | X | | X |
| AXINITE | X | | | | | PHENACITE | | X | | | |
| BARITE | | | | | X | POLLUCITE | X | | | | |
| BENITOITE | X | | | | | QUARTZ | X | X | | | |
| BERYL | X | X | | X | | RHODOCHROSITE | | X | X | | X |
| BLOODSTONE | | | X | | | RHODONITE | X | | X | | X |
| BRAZILIANITE | | X | | | | RUBY | | | | X | |
| CALCITE | | X | | | X | RUTILE | | | X | | |
| CASSITERITE | | X | | | | SAPPHIRE | | | | X | |
| CELESTITE | | | | | X | SCAPOLITE | X | | | | |
| CEROSSITE | | | | | X | SCHEELITE | | | | | X |
| CHRYSOBERYL | | | | X | | SERPENTINE | | X | X | | X |
| CORAL | | X | | | | SMITHSONITE | | X | | | |
| CORUNDUM | | | | X | | SODALITE | X | | | | |
| DANBURITE | | X | | | | SOSOLITE | X | | | | |
| DATOLITE | | X | | | | SPINEL | | X | X | X | |
| DIOPSIDE | | | | | X | SPHALERITE | | | | | X |
| DIOPTASE | X | | | | | SPODUMENE | | X | | | |
| DIORITE | X | X | X | | X | SUNSTONE | | X | | | |
| ENSTATITE | | X | | | | THOMPSONITE | X | | | | |
| EPIDOTE | | X | | | | TIGER-EYE | X | X | X | | |
| EUCLASE | | X | | | | TITANITE(SPHENE) | | X | | | |
| FELDSPAR | X | X | | | | TOPAZ | | X | X | X | |
| FLUORITE | | X | | | X | TOURMALINE | | X | X | X | |
| GARNET | X | X | X | X | X | TURQUOISE | X | X | X | | |
| GOLDSTONE | X | X | | | | UNIKITE | X | | | | |
| HENATITE | X | | | | | VARICITE | X | X | X | | |
| HICKORYITE | | | X | | | VESUVIANITE | X | | | | |
| HOWLITE | X | X | X | | X | WILLIAMSITE | | | X | | |
| HYPERSTHENE | | X | | | | WONDERSTONE | | X | X | | |
| JADITE | X | X | X | | X | WULFENITE | | | | | X |
| JASPER | X | X | X | | X | ZIRCON | | X | | | |
| KYANITE | | X | | | | ZOISITE | X | | | | |

LINCOLN GEM & MINERAL CLUB, INC. - BOARD OF DIRECTORS - Oct. 5, 1987

American Charter - 40th & South Sts. - Mon. Oct. 5, 1987, 7:30 P.M.

7 Board members present & Roger Pabian, Show Chrm. Shirley Rockel & Marie Taylor absent.

Minutes of the Sept. meeting were read with approval motion by Fred Holbert, 2nd by Phyllis Parks. Carried.

Treasurer's report read with approval motion by Fred Holbert, 2nd by Jan Wright. Carried.

BILLS: For payment & approval:

\$ 180.00 Security Storage - Advance payment for Oct, Nov. Dec. Jan. Feb. Mar.
 (\$ 18.00 saving on Storage for advance payment - Suggested by Fred H.)

8.60 Kebin Schwartzman - Film and processing

10.29 Phyllis Parks - Copies, Treas. expense, etc.

Motion for approval by Tom Simmons, 2nd by Jan Wright. Carried.

"88" SHOW BILLS:

\$ 100.00 John Rice - Gold Concentrate (Show Special Feature)

41.04 Accent Printing - Show Flyers

5.80 Roger Pabian - Show Flyers

Motion for approval by Jan Wright, 2nd by Fred Holbert. Carried.

OLD BUSINESS:

Bring up for discussion at Oct. Meeting (date and time of Nov. Meeting)

NAOESCI MEETING:

Roger Pabian only delegate there. Reported association did approve money for new copy machine. Had a Silent Auction to help pay for copier. Good Show displays. State Show in '88 in Omaha.

NO NEW BUSINESS:

SHOW REPORT: Roger Pabian

11 Dealer contracts out. Demonstrations. Gold panning. Possible sapphire dig. Roger Pabian & Fred Holbert going to area Shows (Topeka, Omaha, Grand Island) to distribute flyers, view demonstrations & seek dealers.

Sending articles to magazines, i.e. Lapidary Journal

JUNIOR REPORT: Jan Wright

Excellent meeting on Sept 26th. 5 Juniors in attendance. Pins and patches are available for FRA (Future Rockhounds of America) from AFMS Endowment Fund. (Pins are \$ 2.00, patches are \$ 1.50 each) Motion by Fred Holbert that Jan should order 24 of each for Junior members and future members. 2nd by Vera Lyman. Carried.

Respectfully submitted,

Vera Lyman
 Vera Lyman, Secretary

LGMC Treasurer's Report for October 1987 NBC Checking 10/1/87 \$ 65.91

Monies transferred to checking to pay obligations:

From NBC Money Market account 300.00
 From First Fed. Money Market 100.00

Income: 1988 Show Retail Dealer Space (advance) 750.00

Payments:

| | | |
|--|--------|--------|
| Security Storage (6 mo. at 10% off for prepayment) | 180.00 | |
| Photos for club history activities | 8.60 | |
| AFMS Endowment-for Juniors Pins & Patches | 86.00 | |
| Nebraska Center-September meeting | 45.00 | |
| UNL Printing & Duplicating-Sept.& Oct. P & S | 112.45 | |
| Postmaster-500 precancelled stamps P & S | 62.50 | |
| Prepaid 1988 Show Expense | 46.84 | |
| Misc. postage, copying, meeting expense | 11.56 | 552.95 |

National Bank of Commerce Checking 10/31/87 \$ 662.96

LINCOLN GEM & MINERAL CLUB, INC. - GENERAL MEETING - Oct. 25, 1987

Bethany Park Shelter House - October 25, 1987 - Meeting called to order at 7:45 P.M.

Sept. minutes approved as printed. Motion by Irl Everett, 2nd by Gerald Moore. Carried.

Treasurer's report approved as printed. Motion by Tom Simmons, 2nd by Claude Scott. Carried.

Hospitality Report: 29 adults, 10 Juniors. Guest: Mrs. Gerald Moore

OLD BUSINESS: Nov. General Meeting

Meeting Hall at NE Center not available on Nov. 28 as previously approved for meeting date. Discussion.

Motion by Billie Heffelbower and 2nd by Roger Pabian to have Meeting on Nov. 21 at NE Center. (Nebraska plays Oklahoma that day). If late game (at 3:00) meeting will begin at 8:00 P.M. If game at regular time (at 1:00 or 1:30) meeting will begin at 7:30 P.M. Motion carried.

NEW BUSINESS:

It's Halloween time! So some of the members came in costume! As follows:

Adeline Nolde - Spider Web Turquoise

David Heffelbower - Appetite

Billie Heffelbower - Gypsen

Phyllis Parks - Woolly Mammoth

Tom Simmons - Shell Collector

John Lewis - Lone Ranger

Janet Wright - Country "rock"

Each received a certificate.

SHOW REPORT: By Roger Pabian

5 dealers contracted - payment in full or part

There will be Gold panning - charge*

Sapphire dig - small fee*

*(based on price of concentrate)

Possible Fossil dig

Roger also announced there has been a poor turnout of our Club at other Shows. It's a reflection of attendance from other clubs at our own Show.

Tom Simmons will be in charge of the 'Touch and Feel' exhibit for the blind at our Show.

PROGRAM:

Irl Everett showed some beautiful slides of the "Grand Canyon" and the "Painted Desert". Thanks Irl for an excellent program.

Respectfully submitted,

Vera Lyman,
Vera Lyman, Secretary

INTERFERENCE FIGURES

At the October meeting, I displayed a small quartz sphere between the crossed polarizers of a polariscope. What you saw when you looked through the top of the polariscope was a small black cross that broke the sphere up into 4 sectors. Each sector then showed concentric rings of colors. What you saw was an interference figure---a uniaxial interference figure to be sure (Fig. 1). Locating the interference figure can be very important to the faceter or to the lapidary who wishes to cut properly oriented stars or eyes in nearly transparent to slightly translucent gem materials that do not readily show silk, the oriented fibers or hollows that produce chatoyancy and asterism.

An interference figure is produced only by uniaxial or biaxial minerals. Uniaxial minerals are those that crystallize in either the hexagonal or tetragonal systems---they have one optic axis, hence, uniaxial. Biaxial minerals are those that crystallize in the orthorhombic, monoclinic, or triclinic systems---they have two optic axes, hence, biaxial. Isotropic minerals---those crystallizing in the isometric system, and mineral aggregates such as agate or jade do not produce interference figures.

What is an optic axis? The optic axis is an axis within a crystal along which the refractive index (RI) remains fixed in value. The refractive index is the numerical value of the velocity of light traveling through air divided by the velocity of light traveling through a substance. For example, through a substance in which travels at a velocity of 93,000 miles per second the RI has a value of 2---186,000mps/93,000mps. A crystal can have 1, 2, or 3 RIs. Isotropic minerals have 1, uniaxial have 2, and biaxial have 3. In a uniaxial mineral, one RI is fixed in value and the other RI varies upward or downward in value to meet the value of fixed RI. Since only one RI is fixed in value in tetragonal and hexagonal crystals, they are referred to as uniaxial. Biaxial minerals have 2 axes along which the RIs are fixed, but each at a different value; the third RI varies.

In uniaxial minerals, the direction of the fixed RI is called the ordinary ray and the direction(s) of the variable RI are called the extraordinary ray (Fig. 2). If the extraordinary ray varies downward in value to approach the value of the ordinary ray, the crystal is positive (+); if it varies upward to approach the value of the ordinary ray, the crystal is negative (-). A crystal can be described as B+, U-, U+, B-, or, in some rare cases B+or-. A single crystal can only be one of the above. Uniaxial or biaxial are the optic characters, + or - are the optic signs.

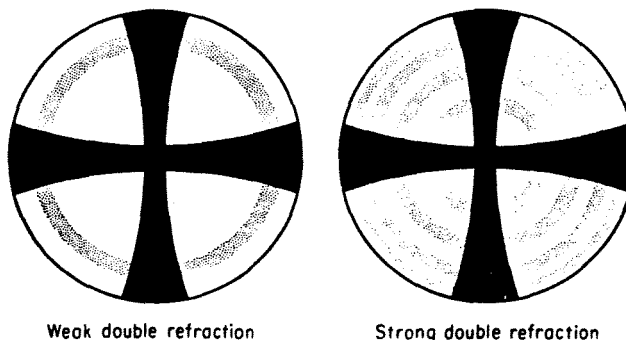


Figure 1. Uniaxial interference figures. After Kerr (1959).

White light vibrates in random directions. Polarized light vibrates in but one direction. The lower polaroid plate in a polariscope is called a polarizer, the upper is called the analyzer. The analyzer rotates whereas the polarizer is stationary. To use the polariscope, the analyzer should be rotated until the field is dark---that is, the polarizers are crossed. To observe the interference figure, the crystal under study should be placed between the crossed polarizers and rotated to extinction, where it appears totally dark. Then, a converging lens should be placed between the crystal and the analyzer---this causes the parallel vibrating light rays to converge into a cone. Note that the sphere serves as its own converging lens which becomes unnecessary in this special case.

In hexagonal and tetragonal crystals, the optic axis and c axis of the crystal coincide, and the center of the cross in the interference figure marks the position of the optic axis. In a uniaxial crystal, light is broken up into the ordinary and extraordinary rays---one set of rays vibrates parallel to a plane that includes the c axis of the crystal and the other set of rays vibrates in a plane that is perpendicular to the first plane. The two rays are refracted at different velocities and travel different distances in passing through the crystal.

When the light rays vibrate parallel to the nicols (polarizing material), the resolution is zero and darkness occurs. The product is the axial cross of the interference figure. At the 45 degree positions, the greatest intensity occurs and the interference colors are the most brilliant. The "legs" of the cross are called isogyres.

Biaxial interference figures are produced in the same way as uniaxial. They assume slightly to somewhat different forms. The axial cross in the biaxial figure has one large and one small isogyre when viewed at 90 degrees and the isogyres split apart when the figure is rotated to 45 degrees (Fig. 3). The thinnest point in the curved isogyre of the biaxial figure is where the optic axis emerges.

Above is a simplification of how interference figures are formed in a crystal and resolved in a polariscope. For further reading, any text on optical mineralogy is recommended. Most of my information came from "Optical Mineralogy" by P.F. Kerr (1959), published by McGraw-Hill Book Company.

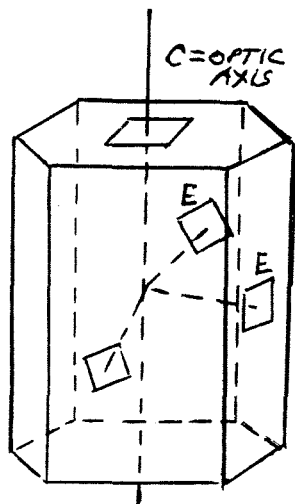


Figure 2. Uniaxial crystal showing c axis or optic axis. RI taken on plane normal to optic axis is fixed (ordinary ray). RI's taken perpendicular to other planes, marked E, vary (extraordinary ray).

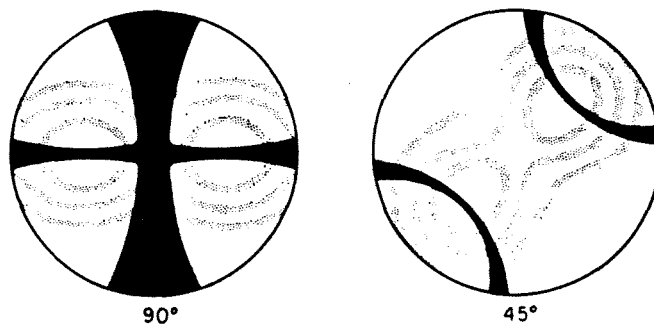


Figure 3. Biaxial interference figures. After Kerr (1959).

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2941 North 65th

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"Satisfied Customers Are Our Best Advertisement"

J J & L ROCKS & MINERALS

"Supplies for the novice to the discriminating Rock Hound"

(402) 792-2337

Shop at 330 Locust, Hickman, Ne.

Mail order & Free Catalog, Box 68, Hickman, Ne. 68372

Jim Marburger

John Harrison

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MINERALS
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SUPPLIES

Read your bulletin to spot *new materials* or *specials* of the above advertisers.

Advertising by a rock-hobby business or interest is permitted with approval of the Board, at a rate now set at \$10.50 per full page per insertion, paid in advance. 1/2 page \$5.25, 1/3 page \$3.50, 1/4 page \$2.75 (min). These ads will be placed throughout the bulletin as space permits.

Subscriptions to THE PICK & SHOVEL are \$3.00 per year mailed.

Dues to LINCOLN GEM & MINERAL CLUB are as follows:

Adult membership fee \$5.00 (age 16 and over)

Junior membership fee \$1.00 (age 12-16)

Family membership fee \$11.00 (husband, wife and all children under 16 - permanent residents of household)

New membership must be approved by the Board, after applicant attends at least one (1) regular meeting of the club, and pay the above dues plus \$1.00 registration fee.

DON'T FORGET: The NOVEMBER GENERAL MEETING IS NOVEMBER 21, 1987

MEETING TIME: 7:30 P.M. if Football game is at regular time.
8:00 P.M. if Football game is at late time.

Plan to attend. This is election month.

DON'T FORGET: CHRISTMAS PARTY - Saturday, December 5, 1987 6:00 P.M.
Nebraska Center - Columbus Room
Gift exchange for those who wish to participate!



h.e.l.p.

HELP ELIMINATE LITTER PLEASE!

MAIL ALL EXCHANGE BULLETINS TO:

Lincoln Gem & Mineral Club
BOX 5342
Lincoln, Nebraska 68505-0342



Edward Ridge
2507 A St.
Lincoln, NE 68502