

Optical Spectra

0273
BR6F



JULY/AUGUST 1968

In this issue...

**fiber
optics**

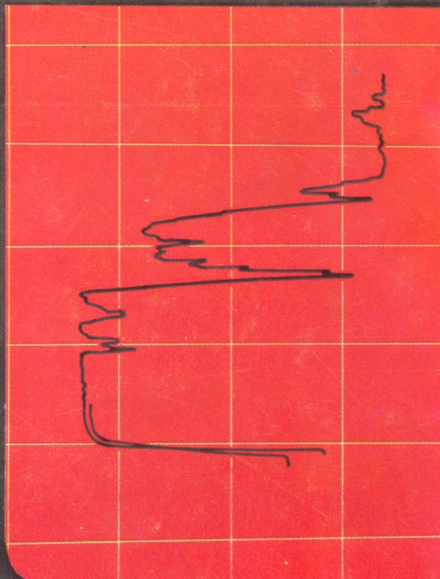


**Gratings for Lasers
Space Age
X-ray Optics
Photometric Units**

5000
TIME

400
KNOTS

2101
DISTANCE



A bimonthly journal reporting on the optical industry and its related fields

EDITORIAL STAFF

Editor & Publisher
Teddi C. Laurin

Associate Editors
R. J. Casey
S. J. Bianco

Editorial Consultants
Greg Klebanoff, Jr.
Francis T. Laurin
Roger B. Linscott

Editorial Assistants

S. Baboorian
P. A. Curran
H. M. Donoghue
L. A. Evans
V. R. Hopper
J. C. Govoni
C. A. Leone

Business Manager

J. S. Bradley

Circulation Manager

B. A. Coffey

Advertising Manager

Marion J. Klebanoff

Asst. to Adv. Mgr.

Derwin K. Sapelli

FIBER OPTICS SECTION

Radiation Effects on Fiber-Optic Light Guides	59
Jack R. Webster	
Sophisticated Light Management Using New Developments In Fiber Optics	64
Paul Fyfe	

FEATURED ARTICLES

Space Age X-Ray Optics	17
E. P. Wallerstein	
Photometric Units and Terms, Part I	25
Ian Lewin	
Lasers	42
Intra-Cavity Laser Diffraction Gratings	49
Rolf McClellan Frank Denton	
Neutral Density Filters	72
Dr. Robert H. Leshne	
Optical Aspects of Color	76
Dr. Fred W. Billmeyer, Jr.	
Photograph of Copernicus?	82
Hector R. Rojas	

EDITORIAL	7
------------------------	----------

FROM OUR PHYSICIST'S NOTEBOOK

Fall-Out and Other Radiation Hazards	81
---	-----------

PROFILES:

Spectrolab	33
Victor Hasselblad Aktiebolag	38
Warren J. Smith	89

NEWS:

Industry	13
International	37
Research & Development	41
Education	85
Government	97

DEPARTMENTS:

Letters to the Editor	8	Meetings	102
Economic Trends	70	New Literature	104
Reader Service		New Products	110
Facing Page	80	Classified	116
Personnel	90	Foto-Lites	124
Book Scan	94	Adv. Index	127
Patents	98		

EDITORIAL ADVISORS

D. C. Anderson, Deposition Systems Mktg. Mgr.
Consolidated Vacuum Corp.

Dr. F. G. Back, Pres.
Zoomar, Inc.

C. E. Baker, Apparatus R & D Lab.
Texas Instruments, Inc.

Donald B. Baltzer
Polacoat, Inc.

Leonard F. Barcus, Asst. to V. P.
Farrand Optical Co., Inc.

R. A. Bennett, Pres.
Applied Products Corp.
Sub. Fostoria Corp.

Dr. F. Billmeyer, Jr.
Prof. of Analytical Chemistry
Rensselaer Polytechnic Institute

C. J. Broomer, Pres.
Broomer Research Corp.

C. H. Brumley, V. P. Director R & D
Bausch & Lomb, Inc.

F. W. Clarke, Pres.
Rogers & Clarke Mfg. Co.

P. W. Collyer
Barnes Engineering Co.

Dr. S. Q. Duntley
Scripps Institution of Oceanography

Dr. M. Herzberger
Eidg. Technische Hochschule Zurich

Dr. W. L. Hyde, Provost
New York University

R. W. Johnson, Dir. Sales Optics & Materials
The Harshaw Chemical Co., Inc.

Dr. Ian Lewin, Research Manager
Holophane Co., Inc.

Dr. A. B. Meinel, Director
Optical Science Lab.
University of Arizona

Dr. Robert J. Meltzer, Vice-President
and General Manager
Special Products Div.
Bausch & Lomb

Dr. H. Nechamkin, Prof. of Chemistry
Trenton State College

R. S. Ploss, Senior Scientist
Baird-Atomic, Inc.

Dr. Leon Podolsky, Consulting Engineer

Dr. Gail P. Smith, Manager of International
Research
Corning Glass Works

W. J. Smith, Director of Development
Electro-Optics Div.
Infrared Industries, Inc.

W. Steuer, Vice-President
Zoomar, Inc.

John B. Thatcher
Optics Technology, Inc.

Dr. C. M. Tuttle, Consulting Physicist
The Optical Publishing Co., Inc.

Dr. George A. Vanasse, Research Physicist
Air Force Cambridge Research Labs.

W. M. Wilson, Mgr. Mfg.
Texas Instruments, Inc.

Sent free to engineers, technicians scientists and management involved in design research, manufacture and application of scientific optics and sophisticated systems. All others \$1.00 per copy. Use eligibility form on Reader Service card to receive your subscription.

MAILING ADDRESS:
Optical Spectra
Seven North St.
Pittsfield, Mass. 01201

© 1968 Optical Publishing Co., Inc.

ARTICLES FOR PUBLICATION and communications regarding the editorial content of Optical Spectra should be addressed to the Editor. Statements and opinions expressed in Optical Spectra are those of the contributors—the publishers assume no responsibility for them.

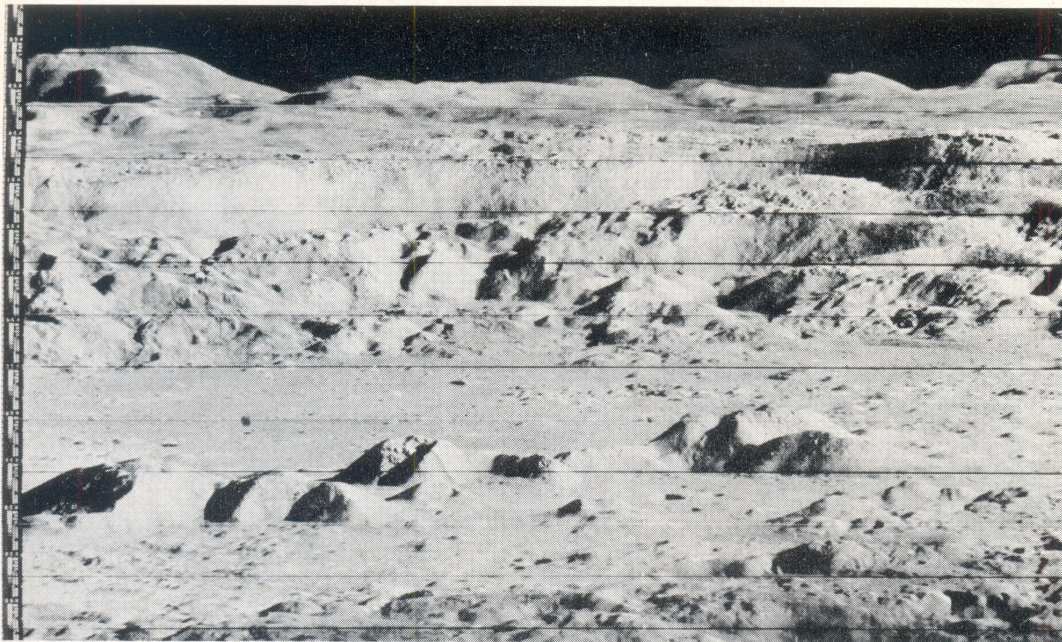
ADDRESS CHANGES must reach the Circulation Dept. four weeks in advance of the publication date. Please include label from previous issue. Write to Circulation Manager of Optical Spectra, Seven North St., Pittsfield, Mass. 01201.

PUBLISHERS OF THE OPTICAL INDUSTRY & SYSTEMS DIRECTORY AND OPTICAL SPECTRA PRINTED IN THE UNITED STATES OF AMERICA.

All rights reserved: Reproduction in whole or in part without written permission from the publishers is strictly prohibited.

Published bimonthly by the Optical Publishing Co., Inc., Pittsfield, Mass. 01201. Controlled circulation postage paid at Pittsfield, Mass. Postmaster: send form 3579 to Optical Publishing Co., Inc., Seven North St., Pittsfield, Mass. 01201.

PHOTOGRAPH OF COPERNICUS?



Sirs:

In November 1966, the National Aeronautics and Space Administration had released to a number of major scientific journals and popular magazines, a lunar photograph taken by Orbiter II based on the belief that it was of the crater Copernicus. Since then, many astronomers have privately commented that the frame furnished by the spacecraft did not correspond to the topographic characteristics of Copernicus shown by the photographs taken from Earth, such as those of the Mount Wilson and Palomar Observatories. The possible difference between photography taken from only 28 miles above the lunar surface and that taken from Earth explains why such astronomers have never publically criticized the interpretation of the picture. It must be also said, however, that few astronomers accepted the interpretation of NASA and have even prepared scientific reports about the inner structure shown by the high lunar resolution photograph.

From August 1966 to August 1967, the writer was preparing at the NASA Manned Spacecraft Center a study about the characteristics of the lunar surface in order to support the Lunar Apollo Program. The study has been done by using the "successive transformations method", which is a discovery made from astronomical observations and is useful for predicting any kind of data. Because of this ability for predicting any kind of data, four reports were then prepared at the Manned Spacecraft Center with the purposes of predicting the optimum lunar landing site for a manned spacecraft (Report No. 1), obtaining the effective temperature of the lunar surface (Report No. 2), predicting the safest lunar landing area for an astronaut (Report No. 3), and analyzing the Surveyor and Orbiter photographs (Report No. 4). It must be said that the "successive transformations method" had the following previous applications: Spectral classification of the type B stars with photoelectric photometry observations sponsored by the National Science Foundation; confirmation of

such spectral classification with spectroscopic observations sponsored by the North Atlantic Treaty Organization (Paris, France); a study of the microwave radiation of the Venus atmosphere by NASA at the Illinois Institute of Technology Research Institute (Chicago, Illinois) and a study of the distribution of blue stars in our galaxy with radioastronomical observations sponsored by the Carnegie Institution of Washington.

In reference to the application to lunar study, the performances of the "successive transformations method" are as follows: The landing site predicted in Report No. 1 is now finally included in the Apollo Lunar Program; the effective temperature of the lunar surface predicted in Report No. 2 for areas other than those of Surveyor I has been confirmed by Surveyor III; the lunar surface composition predicted in Report No. 3 has been confirmed by Surveyor V and the actual location of Surveyor I on the Moon predicted in Report No. 4 has been confirmed by the corresponding Orbiter III photograph of the area where the spacecraft landed. Also in Report No. 4, the analysis of the Orbiter II photograph said to be of Copernicus was undertaken with the purpose of confirming by means other than optical observations, the lunar photographic information furnished by the Orbiters.

For analyzing the Orbiter II photograph cited above, the relevant features of the medium resolution frame were drawn on a transparent plastic with the purpose of comparing their distribution with those suggested by the "effective temperature contours" obtained from extrapolation to the entire lunar surface of the temperature datum furnished by Surveyor I. Such contours are different for depressions, ridges, mountains and craters on the Moon's surface and for this reason the corresponding distribution for each of the lunar features can be easily distinguished in a lunar photograph. From this comparison, it was found that the "effective temperature contours" for Copernicus did not match the distribu-

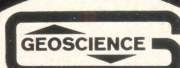
tion of features shown by the picture. The same comparison was then made with other major craters close to Copernicus by using the best lunar maps available, and the result obtained is as follows: The distribution of features shown by the Orbiter II photograph perfectly matched that of the "effective temperature contours" corresponding to the crater Kepler. After this identification, a final test was made by jointly locating the relevant lunar features of the frame, furnished by the spacecraft, on the Orbiter III photograph of Kepler and corresponding topographic information furnished by the lunar map. In that manner, conclusive evidence was obtained that the Orbiter II picture is that of Kepler and not of Copernicus.

In view of the fact that the North Atlantic Treaty Organization and the European Space Research Organization analyze the findings of the American and Russian lunar research, and also in view of the fact that the confirmation of the ability of the "successive transformations method" for the study of any kind of data was only possible with the sponsorship of NATO, the writer has taken the initiative to inform some European people about the lunar studies made at the Manned Spacecraft Center. It then was quickly realized that the identification made about the Orbiter II photograph's feature was very important in the sense that it could have profound effects upon where the first man lands on the surface. Therefore, Report No. 4 has been translated into French and the information about the picture mistakenly thought to be Copernicus is to be released soon. It must be also said that the NASA's Administrator was informed by the writer about the mistaken identification made by NASA, about the translation into French of Report No. 4, and about the forwarding to him of a copy of the French edition through the United States Senate, Committee on Aeronautical and Space Sciences.

The writer is not surprised about the incorrect identification because of the many possible sources of errors. Among such errors, for instance, one can mention faulty radar calibration of the spacecraft based on the present Earth-based data about the Moon, calibration of the sensors for the reflecting sunlight coefficient, also based on Earth-based data, and the complex topography of the lunar area of that crater caused by the multifaceted configuration of the lunar surface. This last characteristic of the surface of the Moon is the most adequate explanation of why Kepler was mistaken for Copernicus, even though Kepler is one-fourth as large as Copernicus and is about 18 degrees in longitude away from it. It is the opinion of the writer that, unfortunately, the importance of the technical mistake committed has been greatly magnified by the fast publicity made by NASA concerning the Orbiter II photograph cited on major scientific journals and popular magazines. Instead, it would have been better to spend more time analyzing the picture before publicizing the results. ■

Hector R. Rojas

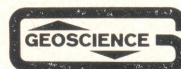
Doctor of the University of Paris
France



**POLITEX[®]
POROMERIC
POLISHING
CLOTHS
AND
PADS**

- **Politex Supreme**
Napless, ideal for chemo-mechanical polishing of solid state materials
- **Politex D**
Densified, smooth-calendered surface. For sapphire, precision optics, lenses, quartz crystals, etc.
- **Politex X**
Felt-like surface, .150" thick. For polishing, buffing glass, TV tubes, stainless steel edges (razor blades), plastics, etc.
- **Politex Pad**
A heavy duty surface used with diamonds and rare earth oxides for polishing piezo electrical crystals and metallographic and petrographic samples.

Politex Polishing Cloths outperform felt, leather, cotton, and non-woven cloths. Long-lasting, excellent for production polishing.



GEOSCIENCE
INSTRUMENTS
CORPORATION

435 East Third Street, Mt. Vernon, N. Y. 10553
(914) 664-5100

Circle No. 144