A A V S O A B S T R A C T S

Edited by R. Newton Mayall

PAPERS PRESENTED AT THE ANNUAL MEETING, OCTOBER 20-22, 1955

The 44th Annual Meeting of the AAVSO marks another milestone in its history, and for the first time all of its proceedings were held away from Cambridge. The kind invitation of Mr. Leo Otis, Director of the Springfield Museum of Natural History made it possible for us to meet in Springfield, Massachusetts, under the most comfortable conditions and pleasant surroundings. Our meeting place was in the heart of the city, and the building is one of a group comprising four museums and a library, that are built around the four sides of a large quadrangle with spacious lawns and beautiful trees. In this lovely setting, beneath sunny skies, we had a most enjoyable time. The home-like atmosphere of the museum's library was especially suited to the Council meeting, and a spacious auditorium was made available for our general meetings. Mr. Otis, in his words of greeting, pointed out the fact that the museums and the library are not owned by the city, but by the City Museums and Library Association, which is a private organization.

Friday evening, Dr. Carl L. Stearns, Director of the Van Vleck Observatory, Wesleyan University, talked to us about parallaxes. After Dr. Stearns' talk, Mr. Frank Korkosz, Director of the Seymour Planetarium, gave us a special demonstration of its operation. This was of particular interest because Mr. Korkosz built the projector in 1937, and it is the first optical planetarium to be designed and built in the United States. Mr, Korkosz is now designing and building the projector for the new Hayden Planetarium at the Boston Museum of Science.

After the planetarium demonstration we visited the workshop of the Springfield Stars Club in the basement of the Museum. Our own Jack Welch gives a great deal of his spare time to his organization. We're proud of you, Jack.

The usual business and reports were completed Saturday morning, and the afternoon was given over to papers. In the evening everyone gathered in the East Longmeadow Congregational Church for a sumptuous supper, following which Clint Ford entertained us with a short reel of color movies he had taken at our meetings for the past few years. Following Clint's presentation, Margaret Mayall bestowed upon him the Badge of the Variable Order of the Inner Sanctum -- a doubtful honor of doubtful value being given to those peculiar observers who observe stars fainter than magnitude 14.0. It took a long time for Clint to learn that his badge would not blow up or squirt water in his eye.

We were particularly happy to have Dr. Harlow Shapley with us and to hear his Highlights of Astronomy (see abstracts). After Dr. Shapley's report, all but a few travelled a few miles more to Clint Ford's house, where his gracious wife Alice entertained everyone with coffee and cake. Some members braved the cold to examine Clint's observatory and equipment, and we understand a few even made some observations in the wee hours of the morning.

Surely no more fitting setting could be found for our meeting. The cultural surroundings and the generosity of Mr. Otis and the Fords made us want to come again. As usual the Fernalds from Wilton, Maine, the Buckstaffs from Oshkosh, Wisconsin, and the Diedrichs from Elyria, Ohio, were on hand. Also, we were particularly pleased to greet Mr. and Mrs. Parker (Pb) from Griffin, Georgia. He became a member in 1928 and this was his first attendance at a meeting. We hope they will make it an annual event. Bob Dunn from Parsippany, New Jersey, arrived looking like a Hollywood photographer, and needless to say he was elected to take the official photograph. He had the pictures in the mail three days after the meeting. We're overwhelmed, Bob!

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TRIGONOMETRIC PARALLAXES, by Carl L. Stearns

We are familiar with parallax and the methods used to obtain it. We know the motion of the earth around the sun causes a parallax shift, but we are apt to forget the struggles leading up to what we accept as common practice today. Aristarchus and Copernicus thought the stars might be too far away to observe parallax. Tycho Brahe, about 1522, could obtain an accuracy of about 30" of arc. His observations brought him to the conclusion that the earth was stationary, because he could not find any parallax. Flamsteed measured the declination of Polaris and found a periodic shift of 40". Bradley discovered the aberration of light. Galileo suggested double stars might afford an opportunity to measure parallax. Herschel thought he could measure it Galileo's way, but he failed. However, Herschel did discover binary stars. It was Kapteyn and Schlesinger who developed the methods used today, and it must be remembered that trigonometric parallaxes are less good as the distance increases. Because of this, other methods have been used, such as the indirect method and the spectroscopic method. But even these are based on trigonometric parallaxes. Another more complicated method uses the masses of stars. But all of these methods have their errors and the probable error of the spectroscopic parallax is less than the fixed probable error of the trigonometric parallax. The causes contributing to the fixed probable error are: human errors in measuring, emulsion, atmospheric dispersion, seasonal, and others. The sum total amounts to only about .033", and it does not look as though we will improve parallax by trying to improve methods. We have come a long way since Aristotle said it could not be done and Bessel who said it could; but parallaxes still present a challenge to us in order to further cut down the probable errors.

STONYHURST SUN DISCS AND THEIR USE, by Ralph N. Buckstaff

The original discs made for use at the Stonyhurst Observatory were drawn to a scale of $10\frac{1}{2}$ inches = 1 solar diameter. The discs must be attached to a board, or some kind of a holder. This apparatus must be fixed so it can be rotated or adjusted to the inclination of the solar equator and axis. In order to get the best results from these charts, the American Ephemeris and Nautical Almanac should be consulted each day for the sun's coordinates, so the holder can be adjusted accordingly.

The Stonyhurst Discs offer an excellent opportunity to watch the day by day progress of the spots across the face of the sun, as well as the positions of the faculae in longitude and latitude. The image of the sun when projected on the Stonyhurst chart is in the true position as when seen with the eye.

THEORY ON PULSATING STARS, by Maxwell Kimball

I was looking through Campbell and Jacchia's book on Variable Stars, and after reading the paragraphs about Eddington's researches into the mechanics of pulsating stars, and that the maximum occurred with the greatest velocity of expansion instead of when the star is of minimum size, it occurred to me that the shining, pulsating, flaring and exploding of stars are all caused by nuclear reactions of some sort. Pulsations in accord with Eddington's theories must die from internal friction, unless energized; and how can variations be caused except by added energy? It occurred to me that pulsating stars might be automatic gas engines energized by a special nuclear reaction set off by pressure and heat near minimum size, which would release added pressure, heat, and brightness during the period of expansion, until the pressure, temperature or heat dropped to a point where the special reaction causing the pulsation would stop, or slow down, to a point where the star would cool and become less bright until the compression and heat of minimum size would start the reaction again.

SOME GLIMPSES OF ASTRONOMICAL ACTIVITIES IN AUSTRALIA,
by Martha Stahr Carpenter

Aided respectively by a Fulbright research award and a research grant from the Australian Commonwealth Scientific and Industrial Research Organization, my husband and I have recently completed a year of work in Australia. In the course of our travels we had opportunities to meet many fellow members of the AAVSO as well as other amateur and professional astronomers. First on the list of AAVSO members was Helen Pillans, whom we saw in Berkeley, California, on the day before we sailed from San Francisco. During our evening in port in Honolulu, we had a pleasant visit with AAVSO member Tony Bonilla, and the other members of the recently formed Hawaiian Astronomical Society. Mr. Robert J. Terry, President of the Society, met us at our ship in the early evening, gave us a most enjoyable sightseeing tour, and then took us to the monthly meeting of the Society, which happened to be on that particular night.

In Sydney, at monthly meetings of the local branch of the B.A.A., we became acquainted with a number of outstanding Australian amateur astronomers. We especially enjoyed meeting AAVSO member Dr. Allan J. Way, whose name was already well known to us through his correspondence with our Recorder. Later we visited him and his wife at their home in Newcastle, 100 miles north of Sydney, and saw his well-equipped observatory. Another private observatory which we had the pleasure of seeing was that of Mr. W. A. Dunhill, located in the country 200 miles west of Sydney.

At the nation's capital, Canberra, we visited Australia's largest optical observatory where the staff includes two AAVSO members, the Commonwealth Astronomer (Dr. Richard v.d.R.Woolley, who has since been appointed Astronomer Royal of England) and Dr. William Buscombe. The well-known Australian work in radio astronomy is carried out in and around Sydney by the Radiophysics Laboratory of the C.S.I.R.O., and it was there that I spent most of my time throughout the year, working on the study of the spiral structure of the portion of our galaxy observable in the southern hemisphere. Optical observatories are to be found in most of the Australian cities which are state capitals, and we were fortunate in being able to visit those in Sydney, Melbourne, Adelaide (now under construction), and Perth. At Melbourne we attended part of a public demonstration which was ably conducted by Mr. L. R. Whitby and Mr. E. W. Murray. After its conclusion we accepted with pleasure their offer to show us some of the objects of the southern sky through the equatorially mounted 3-inch Zeiss telescope of the Astronomical Society of Victoria.

Whenever we came in contact with people interested in astronomy, we found that the AAVSO was well known and well respected, and that we as its representatives were warmly welcomed. Now that we have returned home, it is a pleasure to show to the

American AAVSO members at the Springfield meeting our color slides of most of the observatories I have mentioned, and to convey to them the warm greetings of fellow stargazers on the other side of the earth.

A BRIGHT METEOR IN HIGH MAGNIFICATION, by Gunnar Darsenius (Sweden)

One night, two years ago, I was going to observe the long period variable star RT Dra with my 12-inch reflector (90 power), and was beginning to estimate when a bright meteor crossed the field, rapidly as lightning. About half a second later a trail brightened and simultaneously broadened, then decreased in brightness until it disappeared after about 4 seconds. I don't know if my eye became somewhat blinded and therefore it seemed that the trail appeared some time afterwards, or if there really was a delay before it appeared. The brightness of the meteor as seen in the telescope is very difficult to estimate, but perhaps it was 2nd to 4th magnitude. I looked at my variable star chart and estimated the breadth of the trail to be 4 minutes of arc at the time it disappeared. The maximum brightness of the trail was about that of the Ring nebula in Lyra, M57,i.e., about 9th magnitude, with the same bluish color. Seldom does one get a chance to see such a spectacle in a big telescope. This is the only one I have ever seen, but I do see two to four telescopic meteors every year.

SOLAR FLARES, by Harry L. Bondy

Solar flares are among the most violent solar phenomena. They appear as very short-lived (from 3 minutes to the rare flares lasting a few hours) flashes of light, and are thus well-named as "flares." Formerly they were called "bright chromospheric eruptions." Since Carrington and Hodgson observed in white light the historic flare of 1 Sept. 1859, only a handful of flares have been seen without spectroscopic equipment. Thus flares can be considered strictly a phenomenon visible only in monochromatic light. Flares occur usually within or near large and active sunspot groups and always in plages (faculae). They are accompanied frequently with very active prominences, surges, and high coronal emission as well as with bursts of solar radio noise.

The usual procedure is to observe flares with spectrohelioscopes, or by means of a narrow-band monochromator. Unfortunately the average solar observer neither owns these instruments, nor is he able to construct them because of their complexity. Since about 5% of all flares occur near the solar limb, these may be observed with a simple "prominence telescope" (described in the SD Bulletin, March-April 1955).

Fortunately an indirect method, that of recording Sudden Enhancements of Atmospherics (S.E.A.'s), can also be used for flare patrol. A relatively simple and inexpensive receiver operating on 27 Kc/s ($\lambda = 11$ kc) has been used by Dr. M. Waldmeier and Dr. M. A. Ellison. The instrument used by Ellison at the Royal Observatory, Edinburgh, will be used for flare patrol during the IGY program. The Solar Division hopes to get a number of experienced radio hams to cooperate in such flare patrol work. Full instructions will be available for anyone seriously interested. Write to Chairman Harry L. Bondy, AAVSO Solar Division, 43-58 Smart Street, Flushing 55, New York.

THE OBSERVING GROUP OF THE AAA OF NEW YORK, by William H. Glenn

The Observing Group of the AAA of New York was organized in the summer of 1953 to promote interest in serious observing and to train inexperienced members in the proper techniques of observation. Since that time, the group has grown to a size of almost 60 members, many of whom are active in one or more fields of observing. Monthly lecture meetings are held for instruction and the comparison of data, and field trips are made to points of astronomical interest. Outdoor observation meetings are held at frequent intervals. In addition to this, the group produces a monthly mimeographed magazine, "The Eyepiece," in which observations and informative data are printed. Scientific data are contributed to the AMS, AAVSO, and ALPO. The group has been especially active in the study of variable stars, and over 16,000 visual observations have been contributed to the AAVSO in the past year. In addition, one member of the group is expected to start a PEP program in the near future.

QUESTAR, by Cyrus F. Fernald

Much to everyone's pleasure, Cy Fernald bought himself a Questar (see the beautiful ads in Sky and Telescope), brought it to the meeting and demonstrated its use. This is a unique instrument, beautifully made and well thought out. Of course Cy is going to test it and compare it with his 8" Springfield mounted scope. Harry Bondy commented that he had observed sunspots with a Questar and found it to be outstanding in performance and quality. Questar is really a small portable telescope that can be carried in a small box about 9" x 9" x 15". It appears to have remarkable possibilities and it was good to be able to examine the Questar first hand. (R.N.M.)

VARIATIONS IN TOTAL VISUAL LIGHT PER CYCLE FOR R CYGNI AND RT CYGNI, by Clinton B. Ford

The visual light-curves of the two long-period variables out of the six whose total visual radiations per cycle were reported in the October 1951 issue of these Abstracts have been brought up to date, and the areas resulting from additional cycles have been measured. The AAVSO light-curves used for the 1951 study (extending from 1915 to 1939) suggested that for 193449 R Cyg (Se) there was a systematic decrease in the relative total light per cycle, while for 194048 RT Cyg (M2e) there was a corresponding increase. Complete plots for these two stars have now been measured, utilizing all B.A.A. as well as AAVSO observations back to 1908 for R Cyg (total, 45 cycles), and to 1911 for RT Cyg (total, 81 cycles). The new area data does not appear to strengthen the above suggested trends, but reveals a wide, erratic variation in the total visual radiation per cycle, ranging from 2,032 to 1,163 magn-days for R Cyg, and from 704 to 409 magn-days for RT Cyg.

It is significant that, at least for these two long-period variables, while the period of visual light variation from cycle to cycle may vary irregularly by $\pm 5\%$ from the mean period, and the heights of maxima and depths of minima by as much as $\pm 15\%$, the integrated light per cycle, a quantity indicating the over-all efficiency of each star as an emitter of visual light, is also irregular and shows much wider variations, up to $\pm 25\%$ from the mean. Several other "regular" long-period variables should be similarly investigated in the future.

ANOTHER LOOK AT ALGOL, by Jeremy H. Knowles

Algol deserves another look. The period of Algol is usually given as $2^{d}.876$. Well, let's have some more decimal places. But I find it is not so simple. In 1783 Goodricke determined a period of about 2^{d}, 20^{h}, 49^{m}. Later Argelander showed that this period is itself variable. Professionals have puzzled over this fluctuation and its causes. The amateur may think there is nothing he can add, but I am inclined to think that if enough observations are made with sufficient precision, a valuable check may be made upon predicted minima. By using carefully selected comparison stars, I observe Algol as I do any other variable, to tenths of a magnitude, only I record time to the minute. Usually I found it satisfactory to make an estimate every minute or two. It is advantageous to have observations for two hours before and two hours after the time of expected minimum. Hours and minutes can be changed easily into four place fractions of a day. By plotting the observations and determining the time of minimum from the plots, I checked the observed times with the predicted times in Sky and Telescope. I found I had been 5 minutes early of the predicted 6:59 U.T.,Sept.8,1950; 6 minutes late to the predicted 3:28, March 12, 1955; and 12 minutes early of the predicted 2:47, Sept.23, 1955. At least we know that S & T and I are talking roughly the same language; what we need is -- MORE MINIMA.

REPORT ON THE I.A.U., by Margaret W. Mayall

Everyone who attended the meetings of the Commission dealing with variable stars at the IXth General Assembly of the International Astronomical Union in Dublin, came away filled with enthusiasm for future work on variables. Much of the work of Commission 27 (Variable Stars) under the presidency of Prof. B. V. Kukarkin of the U.S.S.R., concerned the planning of future programs with greater cooperation between observatories and visual observers in various parts of the world. Most of the astronomers present continually emphasized their need for complete light curves of the long-period, semi-regular, and irregular variables. All were in agreement that the only way they can be sure of getting these curves is through the assiduous work of the many groups of amateur observers.

The AAVSO has been asked to add to its program all long-period variables with maxima brighter than 11th magnitude, in addition to all U Geminorum and R Coronae variables bright enough to be observed. I have agreed to add them as rapidly as we can get charts and suitable sequences of comparison stars. This will mean extra work for all of us, but it is very necessary work. Eventually it will add several hundred stars to our program, but we can take care of additional stars if observers will plan their observing hours more carefully. The importance of the use of photoelectric photometers was stressed for observations of rapidly varying stars and other variables with small ranges.

Dr. George Herbig of the Lick Observatory attended an informal meeting of those interested in the programs of the many variable star associations, and made an appeal for special observations of some of the most interesting but little known variables. He would like to be notified by Air Mail of any definite sign of activity in the stars of the following groups: (1) R Coronae Borealis type such as GU Sgr and UV Cas; (2) Nova-like variables, such as AX Per and CI Cyg; and (3) some T Tauri (RW Aurigae) type variables such as RY Tau and UZ Tau. He is also very much interested in some of the early type irregular variables with large ranges, such as UX Ori, BN Ori, and WW Vul.

E-B 120 LEPORIS, by Edward G. Oravec

For the past 8 years I have been observing a red star which appears to be a variable. For the lack of a proper title, I have been using the early designation given the star -- E-B 120 Leporis. This star has an interesting history and was suspected of being variable about 75 years ago. In 1948, AAVSO'er Gilbert Matthews and I were looking for more stars to add to our program. We found this star mentioned in one of the books. The star seemed quite interesting and probably worth observing, so we made a sequence of comparison stars and commenced observation in March 1948. We made a few estimates before the star disappeared into the sun's glare in the evening sky. It is observable from early August till mid-April from 40° latitude. Today there is an AAVSO type "a" chart of this star. It is located near iota Leporis, designation 050611. Our Observers Group (AAA of New York) made the chart, which was drawn by Mr. Roy Seely. I have observed E-B 120 since 1948 and the light curve, courtesy of Mrs. Mayall, shows the result. Most of the early observations are mine. In late 1953 the Observers Group of the AAA also began observing this star. The range is 5.9 to 7.0 in that period, with extremes from 5.8 to 7.4. The curve shows the approximate 10-day means. One must be cautious with estimating the star, for it is quite red, M6 spectrum. Moonlight and haze can affect estimates. There are probably other stars with late spectra that are variables and not recognized. I do believe this star is a red irregular type variable, and should be recognized as one.

ENGLISH OBSERVATORIES, by Charles A. Federer, Jr.

Charlie Federer gave an informal talk, illustrated with color slides, on the English observatories he visited the summer of 1955. Of particular interest were three slides of Jodrel Banks radio telescope. (R.N.M.)

A COLOR FREE SOLAR TELESCOPE, by David W. Rosebrugh

This consists of an F/8 unsilvered 6" plate glass mirror in a Springfield mounting. The secondary and tertiary mirrors are the customary 45-45-90 degree prisms, but reversed so that the reflections are off the unsilvered hypotenuses. A three-fourths inch micrometer focusing eyepiece gives a power of 64. No filter whatsoever is used, as the three reflections off unsilvered glass surfaces, plus some further dimming caused by polarization (the hypotenuse face of the tertiary mirror is not parallel to that of the secondary mirror but turned through an angle of 90°) gives a sufficiently dim image. The brightness is reduced by a factor estimated to be 15,000. Most of the original light from the sun passes through the mirror and forms a circle of light on the ground. This can be used as a "finder." The secondary prism is held in a rather open framework so that that portion of the light which is refracted through it (rather than being reflected to the tertiary prism) can escape to the open sky through the top of the tube. To minimize scattered light the secondary prisms should be shielded from the direct rays of the sun by a cap several inches above it; and a 4" diaphragm at the top of the tube helps by eliminating glancing light on the walls of the tube. This diaphragm also serves to cut the brightness of the image somewhat. When using this "color-free" telescope the sun appears white. More sunspots can be counted with it than can be seen when using my regular 4" solar refractor equipped with Herschel prism and a welder's yellow-green filter. However, granulations are less evident with the "color-free" telescope.

PALOMAR HAS NOTHING ON ME, by John J. Ruiz

Palomar has the largest telescope dome in the world. Mine is larger for it is the dome of Heaven. Palomar has a photoelectric photometer that cost a small fortune, and a single observation costs them thousands of dollars. My photometer cost me little and a thousand observations can be had from me for nothing. Palomar has a large Seismograph with rods extending out 60 feet or more. My Seismograph in my cellar workshop, built in anticipation of the International Geophysical Year, occupies little room yet it can register quakes thousands of miles away, as well as my wife's comings and goings upstairs. PALOMAR HAS NOTHING ON ME. (John J. Ruiz always presents a paper suitably illustrated by color slides. An abstract of his paper is difficult, for it never tells the whole truth. John J. Ruiz must be seen <u>and</u> heard. 'Nuff sed! Ed.)

HIGHLIGHTS OF ASTRONOMY DURING THE PAST YEAR
by Harlow Shapley

(This is the first time *Abstracts* has included Dr. Shapley's Highlights, which are always looked forward to at our annual Fall dinner. We were glad that he could be with us to give them in person.)

Among the highlights in and near the astronomical field during the past year, I select the following as worthy of mention on this occasion: 1. The announcement that the American Government would sponsor the artificial satellite that is designed as a part of the operations of the International Geophysical Year (1957-58). This small body, it is planned, will sail around the earth, reporting as it goes on what this planet does to missiles and meteorites at an altitude of two or three hundred miles. Probably several different satellites will be tried out in the course of this adventure with multiple rocketry.

2. Detection of the Thunderbolts of Jove, or some equally potent electric phenomenon on the surface of Jupiter, by Dr. B.F.Burke and Dr. K.L.Franklin of the Carnegie Institution of Washington through the use of a radio telescope located at Seneca, Md. The disturbing effect, accidentally found in the course of work on a sky survey, has been verified by Australian observers. This is but one of the many remarkable developments of the year in the field of radio astronomy, among which are the Milky Way explorations at Leiden, Sydney, Ohio State University, and Harvard; the building of several large "dishes" in half a dozen countries, and the approach toward completion of the 250-foot radio telescope at Manchester, England.

3. The finding of the star of smallest known mass by Dr. Sarah Lee Lippincott of the Sproul Observatory of Swarthmore. This object, Ross 614B, which has a mass of only one-twelfth that of the sun, is the fainter component of a dwarf reddish double star. Discovered through its wavy proper motion, this record-holder has been actually photographed separated from its primary by Baade with the Hale Telescope.

4. The raising again of the question as to the ownership of the upper air and the right-of-way of outer space. The Boston Museum of Science has been selling stars, clusters, and even galaxies, and issuing formal deeds thereto. (For example, I own the Hercules globular cluster!) But who owns the atmosphere at an altitude where the artificial satellite will run with a speed greater than 200 miles a minute?

5. Conclusion of a 50-year research program by many Harvard astronomers on variable stars of the Magellanic Clouds. The analysis included 3000 variable stars, three-fourths of which are Cepheids. For 1220 of them, periods and light curves have been determined.

6. The definitive identification by Dr. Walter O. Roberts and his associates at the High Altitude Observatory of the University of Colorado and by Dr. David Layzer of Harvard of the important yellow line in the spectrum of the solar corona as due to Calcium XV --that is, to calcium atoms that have only six of their twenty electrons remaining under the high ionizing conditions of temperature and density in the sun's uppermost atmospheric layers.

7. Report by E.C.Slipher of the Lowell Observatory on the 10,000 excellent photographs of Mars in red, yellow, and blue light, made by him with the Michigan Observatory telescope on Naval Hill, Bloemfontein, South Africa, during the recent favorable opposition, also a report by Dollfus, father and son, of France on their photoelectric observations made from a balloon 45 miles above the earth's surface of the small moisture content of the Martian atmosphere.

8. Appearance of the first installment of the two-color star and galaxy atlas, made with the 48-inch Schmidt telescope under the auspices of the National Geographic Society and the Mount-Wilson Palomar Observatory, with important technical assistance from the Research Laboratories of the Eastman Kodak Company.

9. The occurrence on June 20 of this year (1955) of a solar eclipse with the greatest duration of totality, 7 minutes,7.8 seconds, since June 717 A.D., 1,238 years ago. It will be nearly 200 years before this record will be broken, when again the eclipsing moon will be near perigee as the earth nears aphelion.

10. An explanation by C.F. von Weizsaecker of the reason for the sphericity of globular clusters and their freedom from interstellar dust and gas. His theory is that dust and gas have been cleaned out by frequent passage of the clusters through nebulosities in the Milky Way.

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