the usual arithmetic. For example, by definition the number $a + bi$ is integral when a and b are rational integers. Observe that this number satisfies the equation $x^2 - 2ax + a^2 + b^2 = 0$, where the coefficient of x^2 is unity and the other coefficients are rational integers. The sum, difference and product of any two such integers is an integer. If further α, β, γ are any three such integers and if $\alpha = \beta\ \gamma$, we may say that α is divisible by β or by γ; β is a divisor of α, so also is γ. Further, every complex integer is factorable into prime factors in only *one* way. A complex integer $a + bi$ may be taken as a modulus of linear, quadratic and higher congruences with associated theorems that are analogous to those for real integers and moduli. Corresponding to every integer $\alpha = a + ib$ there exists a system of $a^2 + b^2$ integers such that no two are congruent (mod α), whereas every integer of $R(i)$ is congruent to one of these integers (mod α). Euclid's method of finding the greatest common divisor is also applicable. The so-called Fermat Lesser Theorem and the Wilson Theorem may be applied to all these integers, and there exist the analogous theorems of primitive roots and the analogous laws of quadratic and cubic reciprocity. The principles just enunciated constitute what is known as the *Arithmetic* of these realms. For the more general realms there exist additional theories, particularly one which treats of the numbers of classes into which the units of a realm may be distributed and another which has to do with the determination of the number of fundamental units which are found in a given realm. These two theories of Dirichlet are discussed at greater length later.

<div align="center">(To be concluded)</div>

<div align="right">HARRIS HANCOCK</div>

UNIVERSITY OF CINCINNATI

THE ECLIPSE OF JANUARY 24, 1925

THE eclipse of the sun taking place on January 24, 1925, is chiefly remarkable by the fact that the zone of totality passes over an area more thickly populated than any other of modern times. At sunrise somewhat west of Duluth the zone includes such cities as Toronto, Buffalo, Rochester, Hartford and New Haven, while close to the northern limit are Syracuse, Springfield, Providence and to the southern limit Wilkes-Barre and New York.

It seemed advisable to make use of this fact partly to secure an exact delimitation of this zone and partly to interest the people generally in the scientific and spectacular features of the phenomena. A special committee of the American Astronomical Society was therefore formed to take charge of the general publicity work required.

The most important factor was of course to secure the cooperation of the daily press. Articles giving details free from technical terms have been sent out through the usual distributing agencies to all newspapers whether published in the big cities or in the small country towns. Starting early in November, these or extracts from them were very generally printed and by the end of the month, public interest was becoming very evident.

Newspapers with large resources arranged for interviews and special feature "stories," while other articles were contributed by astronomers, professional and amateur, for the local press in the smaller cities. Articles in the magazines were left to the enterprise of their editors.

The delimitation of the northern and southern boundaries of the zone is being made by asking for answers from any one interested to certain questions framed in such a way that a person without a knowledge of astronomy or of eclipse phenomena can give information as to whether the eclipse was total or not at his position. Observations of the edge of the moon's shadow as it passes over the earth, of the visibility of the corona and of the sun itself are requested. Just within the zone, the time of duration of totality also furnishes a good position. In connection with this, professional astronomers have been asked to make as many observations of the moon during the month preceding and that following the eclipse, so as to secure a knowledge of its path during this period which shall have the highest possible accuracy. The main reason for this arises from the fact that only during a solar eclipse can an accurate position of the moon be obtained when it is close to the sun. This therefore furnishes positions through a lunation including one at new moon, which last at other times is missing.

The comparison of the different classes of observation, meridian, extra-meridian, photographic and by occultations will be a by-product of the campaign.

The eclipse is also unique in the fact that the zone of totality includes some ten or twelve observatories. These of course have their programs for observation, and other observatories are as usual sending expeditions into the zone. A general feature of most of their work will be the photography of the corona. The time of the year, however, makes the weather problem doubtful, the best chance for clear skies being near the coast and that some fifty per cent. It may happen, however, that the sun will only be free from clouds in parts of the zone not occupied by the professional astronomer and here again the cooperation of the public is asked. Any photograph showing the corona sufficiently to indicate its type is better than none, whatever the scale. It is also suggested that

Petzval doublets and telescopic lenses should be used if they are available.

An extensive radio campaign is being organized by *The Scientific American*. This includes the effects on transmission of the darkness by pairs of observers placed north and south of the zone, one transmitting and the other receiving, the change of intensity being recorded by the receiver of words in selected paragraphs spoken by the transmitter. Another feature with the same idea in mind and reaching all those who have receivers is the broadcasting through certain selected stations of copy selected in advance, the receiver noting the words which show a change of intensity. The committee is also indebted to the editor, Dr. E. E. Free, for much assistance through the journal and its staff in its general publicity campaign.

The committee wishes to take the opportunity to ask all those who have facilities for instructing the public in their neighborhood concerning the eclipse to make full use of them.

Teachers in schools can give talks to the children while lectures to small and large groups both of children and adults, stimulation in various ways through the local press, will all be of assistance. More particularly persons accustomed to making observations of any natural phenomena can assist by instructing those with whom they come in contact how to make the observations asked and to answer the questions. In particular, surveyors and all those familiar with the use of maps can be of very valuable assistance by showing how to give or plot the observer's position. They can assist in the same way by furnishing the local press with detailed maps of their localities, the inch to the mile map being in general sufficient when the position is carefully marked.

The general and scientific literature relating to eclipses is summarized in Professor S. A. Mitchell's "Eclipses of the Sun." An excellent account for the general reader in a small compass is found in the "Handbook of Eclipses" by Mrs. I. M. Lewis. A brief account of the phenomena and arrangements made for general observation by Professor H. N. Russell and the writer will be found in the January number of *The Scientific American,* where are also given the plans for the radio campaign. Any one accustomed to the reading of general scientific literature should have no difficulty in obtaining such material as he or she may need from these sources. The technical details with maps have been published in a pamphlet issued by the Nautical Almanac office and obtainable from the Government Printer, Washington, by sending 30 cents.

The following is the list of questions being circulated:

1. If the sun is not quite eclipsed at your station there will always be a bright edge of the sun visible, or perhaps only a single point. One bright point may appear on one edge of the sun before the other has entirely disappeared. At your station was there any time at which no bright edge of the sun was visible? Answer YES or NO ....

2. If the bright edge of the sun entirely disappeared, how many seconds elapsed before another bright part of the sun became visible? Answer .... seconds.

3. Was the time set down in the last question merely guessed at or was it actually measured? If measured, how was the measurement made? ....

....

4. The fringe of light surrounding the sun and called the corona is fully visible only if the face of the sun is entirely covered. At your station was there any time at which you could see the corona all around the sun? Answer YES or NO ....

5. Could you see any stars or planets at the time when the sun was most completely covered and how many did you see? ....
(If convenient draw a little map showing the positions in the sky of the eclipsed sun and of the stars and planets that you saw.)

6. If you are on a high building or a hill near the edge of the shadow path you may be able to see the shadow advancing across the country. If so, what buildings or other land-marks were inside and what were outside the edge of the shadow? ....
Landmarks inside the shadow: ....
Landmarks outside the shadow: ....

7. It is necessary to locate your position very accurately, so that the engineers who compile the reports will know just where to place your observations on the map. Accordingly, give your position by means of the nearest street intersection (if in a city or town) or by means of some easily located building such as a railroad station, a town hall, or some landmark which can be placed easily on a map by a person familiar with the district

If you have a map of your district published in a newspaper or from any other source, mark a cross on the map at the position where you stood and send in the map with your report.

Even if only one of the questions 1 to 5 be answered, question 7 should be carefully answered.
Name ....
Address ....
Answers may be sent to ''Eclipse,'' National Research Council, or the Editor, *Scientific American*, 233 Broadway, New York City.

It is hoped that a coupon with the above questions may be published by the newspapers in the days just preceding the eclipse, and all who have opportunity to secure its insertion are asked to see that it is correctly printed. The efficiency of a local campaign will be roughly measured by the number and nature of the answers received from the locality in comparison with the density of the population. An in-

teresting by-product may possibly be a study of these answers from the point of view of the psychologist.

The arrangements for the general public to see the eclipse are mainly based on the idea of general cooperation. During the period of totality, all external lights, particularly those in the streets and from automobiles, should be extinguished. In order to achieve this result and to avoid accidents it is hoped that all street traffic may stop within a minute after a signal given by bells, factory whistles or similar means some two or three minutes before totality. Here again cooperation from the readers of SCIENCE in helping to organize this by information and advice to the executives of their localities will be helpful. The position that this is done for the general benefit of the public should be stressed.

For those living near but outside the zone of totality, the usual means of transportation to within the zone by automobile, trolley or train will be available. Special services are being arranged in some cases and it is hoped that there may be similar opportunities offered to the general public by the transportation companies. It is generally advisable to invite the public *not* to come to observatory grounds at the time of the eclipse, silence and freedom from external disturbance of any kind being necessary for the observers to carry out their programs properly. Assistance for this may in some cases be secured by surrounding the grounds by students, boy scouts or members of similar organizations with, perhaps, the assistance of the public guardians of the peace.

It is suggested that in the limits of the zone of totality, such organizations may be utilized to define the limit by placing individuals fifty yards or so apart along a road which has a general north-south direction. As the possible error of the predicted line may be a mile either way, the line should extend to this distance on either side of the predicted limit, which may be obtained from the map published by the National Almanac Office referred to above. Exact positions of the predicted limits given in latitude and longitude have been computed by the office and will be furnished if desired by the writer.

Astronomers attached to observatories will doubtless be glad to give such assistance as lies in their power in carrying out these objects. The American Association for Variable Star Observers, amateurs whose excellent work is now furnishing valuable additions to our knowledge of the stars, has already started to give its assistance both through its general organization and through its individual members. Their widely scattered membership ensures cooperation in many places not easily taken care of otherwise.

ERNEST W. BROWN

YALE UNIVERSITY

SCIENTIFIC EVENTS

OPENING OF THE RAMSAY MEMORIAL LABORATORY[1]

PRINCE ARTHUR of Connaught, who is president of the University College Equipment and Endowment Fund Committee, on November 12 opened the Ramsay Laboratory of Chemical Engineering at University College. The laboratory, which, as its name implies, is to serve as one of the memorials to Sir William Ramsay, is the first of its kind established at the college. It has been fitted up in buildings next to the School of Tropical Medicine in Gordon Street, and there is access to it from the college grounds. After experience has been gained there, the erection of new and permanent buildings is contemplated.

The opening ceremony took place in the botanical theater of the college. Sir Robert Robertson, chairman of the chemical engineering sub-committee, presided. He said that there was a want in this country of men with the technical training of chemists who were capable of transferring a laboratory operation to a large scale. Dealing with the details of training, he referred to a practice existing in the United States of taking students to works, and urged chemical manufacturers in this country to consider whether they could not afford similar facilities.

Prince Arthur of Connaught, in declaring the laboratory open, said that ceremony was the final act in the provision of a worthy memorial to that great man of science, Sir William Ramsay, who for twenty-six years, from 1887 to 1913, held the chair of general and inorganic chemistry at that college, and who by his remarkable series of discoveries during that period earned for himself a place in the first rank of the world's scientific workers and brought honor and renown to the college with which he was connected. After his death in 1916 a large circle of friends and colleagues, not only in this country, but in all parts of the world, decided that a fitting memorial should be raised in connection with his wonderful contribution to chemical science. The appeal was not only of a national character, but of an international character, and met with a ready response from all parts of the British Empire and the world. The memorial had taken two main forms: (1) The foundation of Ramsay Memorial Fellowships in Chemical Science, and (2) the foundation of a Ramsay Laboratory of Chemical Engineering.

The success of the first half of the scheme was shown by the fact that at present the fellowship trusts were administering sixteen scholarships held by carefully selected Fellows from Great Britain, Canada, Denmark, Holland, France, Greece, Italy, Japan, Nor-

[1] From the London *Times*.