from that computed on the basis of coherent scattering. This same argument may, of course, be carried through analytically. The exact computation of J_{ν_0} when the scattering is noncoherent and when no selective absorption is present offers some difficulties, however.

It is probable that the selective absorption for most of the lines measured by Houtgast is sufficiently great to keep J_{ν_0} roughly equal to B_ν for an appreciable range in optical depth. Until this point has been examined more carefully, however, the exact interpretation of Houtgast's data and their apparent agreement with what would be expected from completely noncoherent scattering, acting as pure absorption, are both open to question. In any case, the disagreement between the theory of coherent scattering and the center-limb variations of the far wings is quite clear cut and seems to be considerably greater than could be accounted for even by very large systematic errors in the observed profiles. It may be concluded that Houtgast's work strongly suggests, although it does not quite prove, that noncoherent scattering is the dominant process involved in the formation of strong absorption lines.

LYMAN SPITZER, JR.

NEW YORK CITY
August 14, 1943

ASTROPHYSICAL RESEARCH IN FRANCE IN 1940–1942

Despite the very difficult present conditions in the occupied countries, our French colleagues (like those in Holland[1]) have succeeded in carrying on important astronomical research. This is illustrated by Volumes **4** and **5** of the *Annales d'astrophysique*, one copy of which has recently reached this country. These publications illustrate only part of the astrophysical activity in France, since other notes must have been published in the *Comptes rendus*, the *Bulletins de la Société astronomique de France*, the *Cahiers de physique*, the *Publications de l'observatoire de Lyon*, and other periodicals. Such activity is highly gratifying, since it provides reasonable hope that the scientific reconstruction in all countries after the war may be speedier than many of us had anticipated.

The annual reports of the Service d'Astrophysique du Centre National de la Recherche Scientifique for 1939–1940 (by H. Mineur) and for 1941 (by D. Chalonge[2]) mention that even the construction work at the new observatory in Haute Provence has progressed during the war. The buildings for the general services, the director's house, a big workshop (with the most essential tools), the water system, and three domes (of radius 11.50, 8, and 6.50 meters, respectively) have been completed; in October, 1942, work was being continued on the laboratories, a private house, a dormitory, and a road. The 120-inch reflector is installed but was not yet functioning in October, 1942. A Schmidt telescope of 25-cm aperture, working at $f/1.5$, is probably ready for use, as well as a specially built spectrograph intended for the continuation of the spectrophotometric program (down to magnitude 6, from λ 3100 to λ 6600 A).

Similarly, a good deal of construction and repair has been done—of course, at a very slow pace—at the Astrophysical Institute in Paris; also, a number of spectrographic and other instruments have been built.

The investigations mentioned in the annual reports concern: (*a*) the spectrum of the night sky with fast instruments, one of these having a much higher dispersion in the

[1] See *Ap. J.*, **98**, 235, 1943.

[2] In October, 1942, it was stated by D. Chalonge that H. Mineur was not in a position to write his annual report of the Service d'Astrophysique as he had done in all previous years. The implication of this remark is unfortunately too obvious and will be a source of deep anxiety to all friends of Dr. Mineur in this country.

ultraviolet than hitherto available (D. Barbier, Tcheng Mao-Lin, and others); (*b*) The spectrum of the aurora borealis (Dufay and Tcheng, and Bernard); (*c*) the investigation of the temperature of the stratosphere, as derived from the intensity distribution in the bands of ozone (Barbier and Chalonge) (this investigation has required extensive laboratory work); (*d*) various laboratory, solar, and stellar investigations related to the spectrophotometric program of Barbier, Chalonge, Déjardin, *et al.*: the continuous spectrum of the sun from λ 4500 to λ 3200 A; the color temperatures of dwarfs and giants of type G0; properties of coated mercury discharge tubes as standard sources; construction of a "black-body" standard for calibration of the sources used in stellar spectrophotometry; the continuous spectrum of hydrogen in the infrared; total intensities of the *H* and *Ca* II lines in early-type stars, etc.; (*e*) various investigations of the ozone molecule: especially[3] the demonstration that the glow which accompanies the thermal dissociation of ozone in ozonized air is emitted by nitrogen peroxide (NO_2) (Barbier, Chalonge, Masriera); (*f*) statistical investigations on Cepheid variables (Mineur); and (*g*) investigations on the equilibrium of clusters (Mineur, Mayot).

Only a few of these investigations are found in the volumes of the *Annales* received in this country. Two of the most important ("Continuous Radiation of Various Stars in the Region 3100–4600 A," by D. Barbier and D. Chalonge; "Measures of Total Intensities of the Lines of *H* and *Ca* II in Stellar Spectra," by D. Barbier, D. Chalonge, and N. Morguleff) have been reviewed recently.[4] The present review gives a summarized account of the other papers.

1. *René Bernard (Dept. of Physics, Lyons), "Atomic Nitrogen in the High Atmosphere"* (**4**,13–29).—The author shows that the auroral transition $^4S - {}^2P$ of [*N* I] (λ 3466.5) is absent in the night sky[5] but that it is present in the aurora. The author describes the results of his photometric measurements of the intensities of the [*O* I], [*N* I], and N_2 transitions at the base and the summit of the aurora: λ 3466.5 behaves in the aurora as do the green [*O* I] line and the $A \rightarrow X$ bands of N_2. The author tries to explain the "altitude effect" on the [*O* I], [*N* I], and $A \rightarrow X$ transitions by triple collisions: the dissociation of N_2 is considerable in the aurora, increasing with the height in the atmosphere.

From a long controversial discussion concerning the identification of the nebular transitions $^4S - {}^2D$ of [*N* I] (near λ 5200) in the aurora and the night sky, the author concludes that these lines are actually absent, in agreement with Nicolet's previously published results. Incidentally, in another paper not available here,[6] Dufay, Gauzit, and Tcheng Mao-Lin announce the observation of the λ 5200 line in the high atmosphere. Pending detailed information, the reviewer prefers to abstain from any comment concerning this problem.

2. *Tcheng Mao-Lin (Observatory of Lyons), "Spectrophotometric Study of the Minima of Algol"* (**4**, 97–117).—The author has reinvestigated the so-called "Tikhoff-Nordmann effect" by careful spectrophotometric measures near the principal minima of Algol. His monochromatic light-curves, which cover the region λλ 3951–6373 A, do not reveal any systematic shift in the times of minima, the dispersion of the instant of minimum being only from 1 to 3 minutes. This result agrees perfectly with Hall's recent photoelectric observations. Most probably the "Tikhoff-Nordmann effect" does not exist; or, if it does, it must be much smaller than was announced by Nordmann and others. The author gives an excellent historical review of the problem of the "Tikhoff-Nordmann effect."

3. *Tcheng Mao-Lin (Observatory of Lyons), "The Absorption Spectrum of γ Cassiopeiae from August to October, 1940"* (**4**, 118–35).—On the basis of objective-prism and slitless

[3] *C.R.*, **213**, 1010, 1941.

[4] J. Greenstein, *Ap. J.*, **97**, 445, 1943; O. Struve, *Ap. J.*, **98**, 231, 1943.

[5] Obtained independently by the McDonald observers (*Ap. J.*, **93**, 337, 1941).

[6] *Pub. Obs. Lyon*, **3**, 59, 1941, reference found in paper No. 8 by R. and L. Herman.

spectrograms of γ Cas the author has established a list of absorption lines in the region λλ 3890–5317 A. In agreement with observations made in this country, the lines of *H*, *He* I, and *Fe* III are found to be very intense. A large number of other elements are mentioned, some of which seem very doubtful to the reviewer on the basis of a comparison with the McDonald slit spectrograms, which are of much higher quality.

4. *D. Barbier, D. Chalonge, and E. Vigroux (Paris), "Spectrophotometric Investigation of the Lunar Eclipse of March 2–3, 1942"* (**5**, 1–22).—The results described in this paper are of a more or less provisional nature, the aim of the authors being to call the attention of the astronomers again to the important results concerning the high atmosphere which are likely to be obtained from a more thorough observational treatment of lunar eclipses. The essential telluric features are the bands of oxygen (B- and α-bands) and ozone (Chappuis system). The intensity distribution of the ozone bands across the eclipsed disk of the moon provides data on the distribution of ozone in the high atmosphere of the earth.

5. *D. Barbier and D. Chalonge (Paris), "Photometric Investigation of the Lunar Eclipse of March 2–3, 1942"* (**5**, 58–70).—The photometric study of lunar eclipses is of importance in relation to the high atmosphere of the earth,[7] the method consisting essentially in measuring the variation, during the course of an eclipse, of the luminosity of a small region of the lunar disk. The authors employed the photographic method of Fabry and Buisson with a yellow filter. They compared their results with those obtained by Danjon in 1921 and 1931, and by Rougier at the March, 1942, eclipse.

6. *J. Dubois (Observatory of Bordeaux), "The Electrometer Tubes,"* (**5**, 23–37).—This is a technical discussion of the utilization conditions of the Philips No. 4060 electrometer triod; the results may be readily applied to other electrometer tubes.

7. *E. Vigroux (Paris), "Source of Continuous Spectrum for Spectrophotometry in the Visual Region"* (**5**, 41–57).—The author has discussed all factors affecting the spectral intensity distribution of the continuous emission by a certain fluorescent screen excited by a mercury-vapor lamp and giving a fairly uniform photographic density between λ 4400 and λ 5500 (prism spectrograph, Agfa ISS plates). The intensity distribution is independent of the factors examined: aging of the tube, intensity of excitation, temperature, even composition of the exciting light. The source has been compared to the black body through the intermediary of a calibrated incandescent lamp with tungsten ribbon; it has been utilized for the photometry of the lunar eclipse of March 2–3, 1942. The emission may be obtained very homogeneously over the whole surface of a screen of 6 cm.[2] The fluorescent coating consists of a mixture of several mineral substances.

8. *R. and L. Herman, "Extension of the Lyman-Birge-Hopfield System of N_2"* (**5**, 71–81).—Attention had been called[8] to the desirability of additional laboratory work on the Lyman-Birge-Hopfield system of N_2, which had heretofore been measured only up to λ 2162, the reason being that extrapolated wave lengths for high vibrational quantum numbers v'' seemed to agree with the wave lengths of unidentified bands in the night-sky spectrum. Renée and Louis Herman have succeeded in obtaining a discharge giving fairly intense Lyman-Birge-Hopfield bands up to λ 2600 and have shown that the previously adopted formula for the vibrational system must suffer important corrections. When these corrections are applied to the vibrational formula, the tentative identifications suggested for the night-sky features appear less convincing. Incidentally, these suggested identifications have been superseded in a more recent paper.[9] The reviewer is of the opinion that it might be a good plan to postpone all discussion of identifications of

[7] Link, *Bull. Astr.*, **8**, 77, 1932.

[8] *Ap. J.*, **93**, 337, 1941; also *C.R.*, **213**, 360, 1941.

[9] *Ap. J.*, **97**, 72, 1943.