jective prism giving a dispersion at $H\gamma$ of 45 A/mm. The estimates of line intensities were carried out at Harvard, two-thirds of them prior to 1942. The reductions were performed on the International Business Machine equipment of the Ballistic Research Laboratories, Aberdeen Proving Ground, through the generous permission of Colonel Leslie E. Simon. The advantages of punch cards in the reduction of data for "normal" stars are discussed.

The spectroscopic absolute magnitudes are compared with absolute magnitudes computed from trigonometric parallaxes, reduced proper motions, and spectroscopic results obtained at other observatories. The relative scale and zero-point errors of the Harvard reductions for the main sequence stars are within the natural uncertainties of the various systems. A total dispersion in absolute magnitude of ± 0.7 – 0.8 is found of which ± 0.5 mag. is apparent observational error. This leaves ± 0.5 mag. as the indicated dispersion of the true absolute magnitudes, a result not inconsistent with published results from various statistical investigations.

The list of stars contains numerous peculiar objects, namely:

- 6 "Strontium stars"
- 1 "Chromium Europium star"
- 39 "Metallic-line stars"
- 9 Cepheid variables
- 1 Star with probable variable spectrum, HR 7055
- 23 Other supergiants.

The Harvard absolute magnitudes for the supergiant stars are poorly determined. This is primarily because these stars were not separated from the others in the automatic machine reductions, and it is well known that all the criteria for the run of the stars are not applicable to supergiants. Also, too few data are available for an independent calibration of the supergiants. They are, however, included in the discussion in order to demonstrate the consequence of ignoring luminosity class before calibrating supergiant luminosities.

About 40 of the stars have "ambiguous" spectral classes. On the basis of Miss Cannon's Henry Draper criteria they are A stars while Mount Wilson's metallic-line criteria place them in the F groups. The absolute magnitudes estimated for both types indicate no definitive preference for either. Color data (Cape photographic magnitudes) indicate a slight preference for the

F-types. On the other hand, in a comparison of Victoria (classified on the Draper system) and Mount Wilson spectral classes for northern stars, the colors of stars with discordant spectral classes appear to favor the earlier class.

For 50 of the stars the Yale Bright Star Catalogue has listed variable radial velocities: 7 Cepheids, 17 possible binary stars, the rest undefined. For 30 of these more than one Harvard spectrum each was available. With the exception of the plates for one Cepheid, the plates showed no variations in line intensities beyond the differences attributable to diverse quality and exposure.

The reduction and analysis of data such as those described require a large amount of sorting, listing, averaging and re-sorting of data. A moderately experienced operator would find I.B.M. equipment advantageous except in the analysis of those peculiar stars which are not amenable to statistical methods.

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Hynek, J. A. The Russell-Moore discordant parallax stars.

The discordance between the trigonometric and spectroscopic parallaxes of 52 giant binary pairs first pointed out by Russell and Moore¹ is found to remain when the study is extended to additional visual pairs and to 47 spectroscopic binaries. A similar discordance is observed between the dynamic and spectroscopic parallaxes of 103 pairs, thus corroborating the trigonometric results. The failure of the mass-luminosity law for, at least, the brighter members of giant binary stars is strongly indicated.

The evidence presented by all three types of parallax is consistent with the hypothesis that, as a class, the binary stars of the giant sequence are more than a magnitude brighter than normal giants, of nearly twice their radius, and of more than twice their mass. Excessive mass is indicated both by spectroscopic evidence and by direct determination by the usual double star method. There is some possibility that these stars are members of "population II."

1. *Masses of the Stars*, p. 60, 1940.

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Lampland, C. O. Notes on some planetary problems.

The memorable event of the joint meeting of the American Astronomical Society and the

Astronomical Society of the Pacific at the Palomar Observatory could be appropriately called the astronomers' dedication of the giant 200-inch Hale Telescope. The world's most powerful instrumental equipment assembled here with its research staff of eminent scientists, working under the favorable observing conditions, can be expected to make advances in many difficult fields, perhaps more in anticipation for the outer reaches of the observable universe; but there is also the promise that some difficult and outstanding problems in our own solar system still await assistance towards more complete solutions. It was with these thoughts in mind that the writer at this time ventured a few comments on planetary problems.

Planetary investigations during the first half of this century have made steady progress if one pauses to count what has been accomplished. Visual observations have continued in the traditional systematic way to add to our knowledge, but new methods of research have also been introduced, as one may enumerate briefly, in the way of planetary photography, spectrographic investigations of planetary spectra for rotation and atmospheres, radiation researches in the measurements of planetary radiation with the information this work brought on planetary conditions and temperatures, the developments of quantum mechanics, band spectroscopy and laboratory experiments in the further interpretation of planetary spectra, leading to the identification of methane, ammonia and carbon dioxide in the planetary atmosphere, and lastly the application of recent war time developments of highly sensitive energy detectors, bringing still further additions to our knowledge in such discoveries as carbon dioxide in the Martian atmosphere.

In this brief outline it is not possible to give deserving mention and credit to the work of the many eminent investigators who have contributed in essential ways to these important advances. But this progress in our knowledge has not cleared away confusing views concerning conditions prevailing on some of the planets. One might mention that views are still held that the polar caps on Mars may be carbon dioxide deposits, an impossible state of affairs, as recognized by investigators with some knowledge of physics. One also finds quite often remarks that on the planet Mars the temperatures everywhere must be below freezing. That viewpoint was made untenable by the radiometric measurements which showed clearly that the temperature

under noonday sun may be as high as 30°C , and further that the radiation from the planet followed closely the insolation, rising to maximum values in the higher latitudes at summer solstice of the southern hemisphere. There is, of course, the difficult question to answer as to the temperature of the night side of the planet, the prevailing opinion being that the temperature falls very low due to the escape of the radiation through the clear and thin Martian atmosphere. The amount of carbon dioxide recently detected in the Martian atmosphere should exercise considerable effect on the heat economy and climatology of the planet (but one must admit there is apparently a fairly clear window for the escape of planetary radiation). Naturally there would be great interest in efforts to obtain measurements of radiation from the planet's surface after sunset and before sunrise. In this extremely difficult undertaking, one might hold a slight hope that something may be accomplished with the powerful equipment and good observing conditions on Palomar Mountain.

Some weeks before and following opposition, areas of the planet's surface are accessible for observations but are not illuminated by the sun. These are the regions of "defect of illumination" which are in the dark some hours before sunrise and after sunset, and which can be explored by receivers sensitive to long wave radiation. However efforts to measure radiation from such areas would seem to meet with almost insuperable difficulties. The energy would be feeble; the problem of contamination by the much more powerful radiation of shorter wave length overflowing from the illuminated parts of the disk by scattering and disturbed seeing, would be difficult to overcome. But modern efficient filters or screens, such as selenium, cutting off radiation of shorter wave length and transmitting efficiently long wave planetary radiation would be helpful observing means. A large image for resolution and analysis would be desirable and the finest definition would be necessary.

One must expect valuable planetary contributions through this powerful equipment in several ways, and to mention only one—the spectroradiometer—should bring highly desirable data. Filter separation of the spectral components of the long wave energy of planetary radiation has given important information on planetary conditions and temperatures. Radiation from Mars has been found to follow insolation, as mentioned. In the case of Jupiter, the surprisingly low tem-