ponent. In the work described here, the two $\bar{\Pi}(R)$ curves are initially not in agreement, and hence necessitate a change in the adopted solar motion at right angles to the Π component.

For the stellar sample, there is no significant difference between $\bar{\Theta}(R)$, $l^{\text{II}} < 180^\circ$ and $l^{\text{II}} > 180^\circ$.

Depth Dependence of Turbulence in the Solar Photosphere. DONALD C. SCHMALBERGER, *Indiana University*.—Calculations have been carried out on the center-limb variation of the profiles of two metallic line blends and six single lines in the 6100–6150 Å region of the solar spectrum. The profiles were computed assuming LTE, with the lines formed in pure absorption in two (unpublished) nongrey model atmospheres by Swihart. Observational profiles were from photoelectric tracings taken by Waddell with the double-pass Littrow spectrograph of the Sacramento Peak Observatory.

The anisotropic, depth-independent model of turbulence derived by Waddell (thesis, 1956), and several anisotropic depth-dependent models were employed. The computed center-limb variation of the single line central intensities and half-widths is in moderately good agreement with those observed whether the turbulence parameter is made variable with depth or not. With a depth-dependent model, however, it was found possible greatly to improve the agreement in the center-of-the-disk profiles while retaining the customary fair fit at the limb.

Direction of Time and the Equivalence of “Expanding” and “Contracting” World Models. D. L. SCHUMACHER AND H. G. HORAK, *University of Kansas*.—It is initially posited that only thermodynamic processes can determine the direction of time; though the considerations are quite general, the example given is the spacially closed universe with event-horizon. It is noted that in the usual view of the direction of time: (a) the contracting state is conceptually obscure, since more radiation is absorbed than is emitted by test thermodynamic systems; (b) emission is distinguished from absorption by the characterizations “earlier” and “later.” The view is adopted that entropy increase through loss of energy from test system to metrical field governs the direction of time, and hence depends on the universe as a whole (the expansion) to “absorb” any amount of energy carried by quanta having vanishing rest mass. However, we regard item (b) as *tautological*, since it is these processes themselves which establish a direction of time. Emission and absorption by matter are redefined nontautologically as the processes having, respectively, the most

and least associated energy or even as having the most and least numerous interaction vertices associated with photon or neutrino lines. Direct interactions with the metrical field are excluded from this definition, for this should imply detailed balancing. It is seen that if the only clocks are associated with the test thermodynamic systems under our assumptions, the expanding and contracting models are *identical*, hence item (a) can also be rejected. The notions of expansion and contraction break down, since there are no independent clocks. This view corresponds *precisely* to the “elliptic model” of Schrödinger, which was suggested by entirely separate considerations (*Expanding Universes*, Cambridge, 1956), wherein antipodes on the model with explicit time parameter represent the *same event*. The view is expressed that the equivalence of the “expanding” and “contracting” models subsumes all other temporal reversibilities of physical theories, since there is a connection between the sense of the signal and the direction of time. Schrödinger’s model is found to be compatible with quantum-mechanical transition from probable to actual. It is remarked that autonomously changing gravitational field strengths can produce the cosmological redshift.

Longitude Effects in Jovian Decametric Radio Emission. HARLAN J. SMITH, *Yale University Observatory*.—The essential impossibility of directly resolving Jupiter’s surface by any radio technique, other than microwave interferometry, forces decameter radio astronomers to use inferential approaches in localizing radio phenomena. The principal technique has been to determine a precise radio rotation period from the data, then to use this period to establish the frequency or probability of detection of decameter noise storms as a function of Jupiter’s longitude of central meridian (LCM).

Three principal LCM regions associated with (not necessarily the source of) emission have been suspected for some time. Douglas (*Astron. J.* 65, 487, 1960) has specified these as Regions 1 and 3 ($\lambda_{\text{III}} = 110^\circ$ and 280° , respectively) and the principal Region 2 (212°). If emission frequency as a function of longitude is plotted as a polar histogram centered on Jupiter, the longitude-associated character of the decameter radiation stands out clearly as a lobe pattern the appearance of which supports the view that these regions correspond to integrated cones of emission.

This paper summarizes evidence, from our own and other observers’ data and conclusions, that: (a) for each cone, the emission cone angle is nearly independent of the intensity of the storm, (b) the basically trilobed character is strongly marked over the entire span of existing observations, (c) at a