



#### PHOTOGRAPHY LIMITS ASTRONOMY

*Ability of telescopes to reveal the detail of heavenly objects is limited by the grain of photographic plates. The photograph of the moon at the left is clear and sharp, but when greater magnification is attempted as in the section shown on the right, the result is fuzzy on ordinary photographic plates.*

suddenly may accelerate or decelerate, and then moves for a while at the new speed. The best observations of this phenomenon have been made by Dr. Edison Pettit, of Mount Wilson Observatory, who has recently been collaborating with Dr. Robert McMath at the McMath-Hulbert Observatory in Michigan.

By the Menzel theory for the first time the peculiar speed characteristics and levitation effect may be explained in terms of radiation pressure alone, without conjecture as to possible action of other forces, magnetic or electrical.

As is well known, light impinging on any substance, will exert a pressure, provided the energy is absorbed. The atoms of the solar atmosphere are singularly transparent to light of most colors. But in the far ultraviolet are found strong absorptions arising from the element hydrogen. According to Dr. Menzel's theory, if, in addition, there are bright emissions of hydrogen light, the solar hydrogen atoms suddenly impelled up or down by excess pressures are subjected to a control which tends to equalize the gravity and radiation pressures, or in other words to make the new velocity constant.

The controlling bright hydrogen emission line would probably possess a dark absorption line running through its center, Dr. Menzel said.

If the energy for the prominence movements originates from such a source, then by the Doppler effect the steady speeds of the atoms can be explained. An atom subjected to excess radiation pressure will be accelerated and will absorb in the "wing" of the emission line, where the radiation pressure is diminished; conversely, an atom subjected to excess gravity pressure will tend to move into an energy range where the radiation pressure is increased.

Because the earth's atmosphere is opaque to these radiations, we cannot observe them directly, but only infer their existence from studies of the sun's atmosphere.

A temperature in the sun of from 12,000 to 15,000 degrees Centigrade would be required to supply the ultraviolet radiation pressure necessary to control the prominences, as visualized in this theory, Dr. Menzel said. There have been recent observations tending to confirm such a high temperature, although past estimates have ranged as low as 6,000 degrees.

Dr. Menzel pointed out that an earlier theory of solar prominence energy proposed by Dr. E. A. Milne, British scientist, where the supporting radiation was assumed to arise from an absorption instead of an emission line, led to calculations of steadily increasing speeds of atoms subjected to excess pressures. These calculations do not agree with observations of prominence behavior, Dr. Menzel said.

#### Grain Size Limits

**T**HE GRAININESS of photographic plates is a limiting factor of the ability of telescopes to resolve the detail of stellar and planetary objects, Dr. Kevin Burns of the Allegheny Observatory, Pittsburgh, Pa., reported.

For telescopes having aperture F18 (focal length 18 times the diameter of the aperture of the telescope) the full resolving power of the instrument will separate detail of objects only 100th of a millimeter. Ordinary process plates are too coarse in graininess to obtain this limit, Dr. Burns said. However, new special plates of finer grain are now available which will just do the job.

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#### SEISMOLOGY

#### Changes in Gravity May Warn of Earthquake

**C**HANGES in the force of gravity, hitherto supposed to be constant at any one point, may provide scientists with a means of warning of imminent earthquakes.

This possibility of predicting the frequently destructive movements of the earth's crust was advanced before the Geological Society of America by Prof. George W. Bain of Amherst College.

"Compression precedes the violent expansion and results from active and essentially continuous earth movement," Prof. Bain explained in describing occurrences preceding and accompanying earthquakes.

"While compression is increasing, rock compressibility must be diminishing and rock density and likewise the force of gravity must be increasing. The magnitude of the change in either compressibility or the force of gravity indicates the earthquake imminence," he declared.

Scientists can measure these changes in the force of gravity, he pointed out.

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An epidemic of cholera in northern India recently took 17,000 lives.