highest expression, namely, the Hopewell, lies well toward the east in this area.[3]

Without binding oneself to the thesis of Huntington,[4] that climates virtually control civilization patterns, it may be well to note that middle western climate has been until recently much less humid as judged by vegetation than it is to-day. This fact has been developed quite independently of parallel evidence in Europe. It was first established on good floristic grounds by Gleason, whose most recent paper[5] gives an excellent summary. Meanwhile Auer,[6] in Canada, and the present writer and his students, working in Iowa and the Erie Basin,[7] have secured good confirmatory evidence from a microscopic study of recent peats. Additional confirmation is afforded by a recalculation of the results reported by Lewis and Cocke[8] for the Dismal Swamp of Virginia.

Making due allowance for all the difficulties and sources of error involved in reconstructing past climates, it may be safely stated that until a few hundred years ago the characteristic vegetation of the corn belt lay considerably to the eastward, and has since shifted west. Many other details of postglacial climate are still highly debatable, but this at least appears well enough established to merit attention from all who are concerned in interpreting biological phenomena in the United States. The westward swing of such conditions in recent centuries was accompanied by an advance of the humid deciduous forest from south and east. Did this favor cultures which lived largely by war and chase as against those more dependent on tilling the soil (without the aid of steel tools and draft animals)? Did this change become effective before or with the great interior displacement of American tribes caused by white pressure and bartered firearms from New England and Dutch New York?

Any causal explanation which the writer might advance would be mere conjecture. But the fact remains that the cultural climax of the northern maize civilization occurred toward the east of the present corn belt, and at a time when corn-belt conditions were in all likelihood east of their present location.

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[3] *Ibid.*, p. 187.

[4] E. Huntington, "Civilization and Climate," 2nd Ed. 1922.

[5] H. A. Gleason, "The Vegetational History of the Middle West," *Ann. Assoc. Am. Geog.*, XII, 39–85, 1922.

[6] V. Auer, "Peat Bogs in Southeastern Canada," *Mem.* 162, Geol. Surv., Can., 1930.

[7] Inv. Manuscript read before Syst. Sec. Bot. Soc. Am., December, 1930.

[8] Lewis and Cocke, "Pollen Analysis of Dismal Swamp Peat," *Jour. Elisha Mitchell Soc.*, 45: 37–58, 1929.

TYNDALL BEAM INTENSITY OF TURBID COLORED SOLUTIONS

MOST of the work on the Tyndall beam intensity of turbid solutions has been carried out with dispersions in colorless media, or in such a way that the absorption due to the dispersion medium could be neglected. P. V. Wells has shown (*Chemical Reviews*, 3: 331) that under these conditions the Tyndall beam intensity is a power function of the depth or the concentration as a first approximation. The writers have used the Pulfrich photometer, manufactured by Zeiss, to investigate the turbidity in a colored raw sugar, in solutions of varying depth and concentration. Under these circumstances a correction must be applied for the absorption due to the coloring matter. It was found experimentally that Wells' equation holds if there be substituted for the Tyndall beam intensity itself, the ratio between it and the percentage transmittancy of the same solution, measured in the same absorption cell and at the same wave-length. For equal concentration at varying depth, or for equal depth at varying concentration, the exponent in the formula is independent of wave-length. The detailed results of this investigation, which is being continued, will be published elsewhere.

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THE CURVATURE OF SPACE

IN an address made at the dinner in honor of Professor Einstein at the California Institute of Technology, Professor Frederick H. Seares made some very interesting remarks about the curvature of space. After explaining how Einstein has shown us that we may with advantage change some of the rules of world building, he makes the rather astounding assertion "that curved space means only a new set of rules which require that measurements be made along curved lines." The layman will no doubt exclaim, "Well, I thought they were offering me a camel to swallow, but it turns out to be only a gnat." For, of course, we can make measurements in space in any way we like. From time immemorial astronomers have measured the course of a planet or comet traveling along its orbit, be it an ellipse, parabola or hyperbola. It hardly required the insight of an Einstein to discover that fact.

To make matters still clearer Professor Seares brings up the time-honored illustration of measuring distances along the earth's surface. Of course we would naturally measure the distance from Pasadena to New York on a great circle, or more likely by the actual route traveled by our railroad train—a decidedly crooked path. But suppose we wished to use this distance as a base line to find how far away the