conveyed more effectively by speaking of *genic* differences than by adding extra syllables. The "type" part of Johannsen's words has served only to confuse the issues, as in the passage where Shull says that phenotypes and genotypes are abstractions relating to types but not to groups. How can there be typical differences, in any biological sense, unless groups are compared? The fact seems to be that Johannsen was not using the word type in accord with biological traditions, but in a loose metaphysical way that renders the terms more abstract instead of more concrete.

There should have been no difficulty in finding suitables names for the two classes of Mendelian hybrids that Shull has pointed out, instead of allowing them to become confused with Johannsen's genotypes and phenotypes. As the so-called genotypes are supposed to have the same gens, they could be described as isogenic hybrids or isogens. Any group treated as having biological unity may be called an isogen. Johannsen approached the idea of biological unity in the passage explaining the use of phenotype, but did not provide a name for such groups except indirectly through the genotype concept.

The hybrids that have different germinal constitutions, and yet look alike, could be described as isophanic hybrids or isophans. They have the same dominant characters, but this does not involve any complete statistical or phenotypic unity. The groups are formed with reference to alternative, Mendelian characters, instead of on the basis of statistical measurements of continuous variations. As Johannsen pointed out, even genotypical unity does not preclude phenotypical differences.

Pluralizing the word gen is another difficulty encountered by geneticists. Johannsen used the term mostly in its German plural form, *Gene*. Our writers have added another letter making a double plural, "genes," something like "memorandas."

Johannsen proposed gen as a simplification of Darwin's term pangen, to avoid the implications of Darwin's theory of pangenesis:

> Instead therefore of pangen (*das Pangen*) and pangens (*die Pangene*), we shall simply say gen (*das Gen*) and gens (*die Gene*).

Along with this word *gen*, to represent an invisible rudiment or transmitted germ of a character, it will be useful to have a corresponding term, *phan*, to represent an external manifestation or expression of a character. To be able to refer to the external expression or phanic relations of characters is quite as important as to discuss them from the standpoint of theories of transmission. From these two roots it will be easy to develop a simple and appropriate terminology for many of the facts of heredity.

O. F. Cook

Washington, D. C.,
February 24, 1912

Cross Cutting and Retrograding of Stream-beds

In the October (1911) number of the *American Journal of Science*, I read with interest an article by Mr. John Lyon Rich on "Recent Stream Trenching in the Semi-arid Portion of Southwestern New Mexico, a Result of Removal of Vegetation Cover," on which I have ever since intended making brief comment, because it seemed to me Mr. Rich presented only one phase of the subject. While the stated factor, "removal of vegetation cover," may in some localities, accelerate the retrograding (trenching) of stream-beds, it is not, in my opinion, the cause of retrograding. I noted the same characteristics (and others probably also noted) years ago in places where there were no cattle and never had been any.

The "trenching," Mr. Rich says, "is still in progress," which is true, for it has always been and always will be, in progress, cattle or no cattle, vegetation or no vegetation, not only in semi-arid regions but everywhere. There are differences in degree and rate—that is all—and in arid regions the rate is conspicuous.

There are two forces at work wherever water runs or ice flows, which, so far as I know, have not been sufficiently defined up to the present. They are *cross-cutting* and *retro-*

grading of stream-beds. They are close companions and they are among the chief causes of degradation in any region, being more noticeable in mountainous semi-arid regions because inequalities of stream flow are greater in such regions.

Every water course (or glacier course) is subject to cross-cutting, on a greater or smaller scale according to conditions. In semi-arid lands it is often violent.

Take a stream flowing in a semi-arid region over the surface of a sedimentary deposit of say 20 feet in depth. This stream bed terminates in some other stream bed which may be dry most of the time, the water of the first evaporating or seeping away before the junction is reached. For some reason this master-stream corrodes its bed more rapidly than the tributary—by sudden flood, perhaps, in which the tributary does not share. The tributary stream bed is cut away at the junction, leaving it high above the bed of the master-stream —the water, if there is any at this point, cascades. The tributary enters by what has been termed a hanging-valley. The process of retrograding then begins in the tributary stream-bed. It is a process of corrosion by undercutting. It may be slow or fast, depending on many conditions. In arid and semi-arid regions, banks of dry earth often remain vertical for years. This is partly because the surface behind the wall (as pointed out by Stanton in his investigation of the landslides on the Canadian Pacific Railway) becomes impervious to water and, like a roof, prevents the earth mass from becoming saturated. Even when chunks of this earth fall beside a stream they do not readily disintegrate unless completely submerged, because the clay forms on their surface an impervious coating. I have seen earth-cliffs 30 to 40 feet high with all the characteristics of a rock-cliff erosion. The run-off is quick. Steady rains are infrequent. The earth mass can not become saturated. But given an abnormally steady and long-continued rainfall, in combination with a "cloud-burst," at the headwaters, and all is changed with startling rapidity. It is dramatic. The tributary flood undercuts its precipice steadily and mass upon mass of the earth drops into the flood to dissolve. The precipice travels up stream.

The tributary stream-bed is immediately placed on a par with its master. When the storm is over the precipice of earth if found at all is found miles towards headwaters. The former stream instead of flowing on the surface amidst verdure and willows and cottonwoods, now glides at the bottom of a desolate and barren earth canyon.

In the retrograding it has cross-cut the mouths of other stream-beds, where in time, the operation described is repeated over and over, as the country is gradually lowered by these forces.

There have been many excellent examples of cross-cutting and of violent retrograding, two of which I may mention. In the 60's of the last century one occurred at the little Mormon settlement of Santa Clara in south Utah. In a single night the stream was metamorphosed. At Kanab, south Utah, a similar example took place about 1900. In an astonishingly brief time the Kanab creek meandering amongst willows and vegetation was transformed into a waste for miles of its course. The channels through which the Colorado River broke into the Imperial Valley exhibited retrograding in its violent form and excellent photographs were made at the time.

In the Mukuntoweap Valley in southern Utah cross cutting and retrograding in rock may be studied. Some small valleys that were cross-cut ages ago remain almost unaltered. They hang 1,000 feet above the master-stream. The explanation seems to be that during the Glacial Epoch the high plateaus at the head waters of the Virgin river were heavily piled with snow and ice which, melting in the summers, carried on rapidly the work of corrosion in the main streams which had sources in the very high lands, while the shorter stream-beds with lower sources were even then arid and were left behind, having no power of retrograding to keep level with master streams. In other words the corrosion of the master-streams ran away from the erosion of the drier valleys, leaving the latter hanging

in the air. The process is the same as when earth is concerned.

F. S. Dellenbaugh

226 W. 78th St.,
New York,
March 29, 1912

REPORTED DISCOVERY OF RADIUM IN NORTHERN ARKANSAS

In this day, new results of scientific work make such rapid appearance that the public in general are very credulous about reported discoveries however unreasonable they may appear, and even scientists are cautious about expressing adverse opinions concerning such, without having carefully investigated them. Apropos of this, a short article that some weeks ago appeared in a St. Louis paper, reporting an alleged discovery of radium in northern Arkansas and naming the writer as authority for its existence, has been somewhat widely copied by the press, and has brought numerous letters to the writer from different parts of the country from New York to California. Among these have been letters from scientists and those engaged in commercial work. The foundation for the report is as follows:

In the latter part of February there came to the writer's office, then at the University of Arkansas, a Mr. Leib, of Bentonville, that state, who brought a cigar box of earthy material which he said came from a cave near his home. It was just such material as might come from any limestone cave. With the box was a photograph which Mr. Leib said had been made by exposing the box containing the material before a camera, for several hours, in an absolutely dark room. The picture was of about the distinctness of an ordinary X-ray photograph. It plainly showed the box, the string about it and the knots in the string.

Mr. Leib was told by both Professor A. A. Steel, of the University of Arkansas, and myself that while the photograph was interesting, careful investigation was necessary before it could be stated that the substance contains any radium or other radio-active material. For this purpose he was advised to send some of it to Professor B. B. Boltwood, of Yale University.

Such is the basis of a newspaper story that seems to have attracted a good deal of attention.

A. H. Purdue

State Geological Survey,
Nashville, Tenn.,
April 17, 1912

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

To the Editor of Science: It is generally agreed that the recent Washington meeting of the American Association for the Advancement of Science and its affiliated societies was one of the most enjoyable, helpful and inspiring meetings ever held in this country. The attendance was large, the programs well filled, the discussions earnest and the efforts of the local committees fully successful in providing ample means for social intercourse without too much distraction from the work of the meeting.

Nevertheless, that meeting probably marks the parting of the ways, and it behooves all of us who have been and still are loyal to the American Association for the Advancement of Science to give earnest consideration to the question of the future policy of that union of scientific workers which has in the past done so much to deserve its title.

Two of the fundamental principles of the association are: first, by means of migratory meetings to arouse interest in scientific matters in different sections of the country; second, to bring together workers in all branches of science, for mutual acquaintance and for the development of broader view-points than is possible from too close absorption in one's own special line.

These ideals could be and have been well realized in the past when the average attendance on such meetings was not too large for the hotel accommodations of most of our cities and when it was usually possible to have meetings of various sections in one building, thus enabling closely related sections to meet in adjacent rooms.