The walls of the tube are negatively charged and the tungsten atoms and particles in the region outside the arc also become negatively charged and thus can not deposit on the walls. In the arc there is a high concentration of free electrons moving in random directions while outside the arc the concentration is low. Thus, according to the Boltzman equation (or the Nernst electro-chemical equation), there must be a potential difference between the interior of the arc and the surrounding space (the arc being positive). The potential distribution must therefore be such that the potential gradient is zero at the axis of the arc, increases to a maximum near the skin of the arc and again becomes small near the walls. Thus from Poisson's equation near the boundary of the arc there must be an electric double layer consisting of an inner sheath having a positive space charge and an outer sheath with a negative charge.

Such a double layer in a gas can only be maintained if the positive ions which continually escape through the positive sheath disappear by recombination at the inner edge of the negative sheath. The presence of particles (or ions) which can take up negative charges will not only bring about such recombinations but will aid in the formation of the negative space charge. At the boundary between the positive and negative sheaths negative tungsten ions lose their charge and in the neutral state no longer repel one another. They can thus condense on one another to form minute solid particles.

The effect of the magnetic field is solely to produce convection currents in the argon due to the non-uniform distribution of current throughout the cross-section. The convection currents cause the arc to be carried to one side of the tube and cause the non-luminous gas carrying negatively charged tungsten ions and particles to flow into the arc on the side away from the wall. At the junction between the negative and positive sheaths all the negative ions and larger particles lose their charges and become either neutral or positive. The neutral atoms and particles then no longer repel one another and thus grow to larger aggregates. As these are carried into the positive sheath they are heated by the energy set free by the recombination of positive argon atoms and electrons and are ultimately disintegrated or evaporated by this positive ion bombardment. The resulting tungsten atoms become positively charged within the positive sheath, and migrate under the influence of the electric field in the opposite direction to that of the convection current. The tungsten thus accumulates at the boundary between the positive and negative sheaths in the form of minute solid particles or aggregates. If any transverse motion causes more rapid concentration at some places than others the increased recombination at these places makes the sheaths more sharply defined and still further increases the rate of accumulation of tungsten. When sufficient tungsten is present at any place to cause practically complete recombination of the positive ions, the skin projects into the arc and then because the direction of migration of the particles in the electric field becomes nearly perpendicular to the direction of the convection currents, the skin forms a kind of funnel from the narrow end of which the globules break away and are carried at the velocity of the convection currents into the body of the arc.

The structure of a detached globule is thus essentially similar to that of the detached arc itself except that it is turned inside out, as can be readily understood from its mode of function.

Thus we must conclude that the inside of a detached globule is negatively charged and that this is surrounded by a positive ion sheath. The tungsten is imprisoned inside the globule in the form of solid particles which are concentrated particularly at the boundary of the regions of positive and negative charge.

The recombination of ions furnishes the energy for the heating of the particles and the maintenance of the electric fields.

These glowing detached globules seem to have characteristics similar in many respects to those that have been described as belonging to ball lightning. It is perhaps not certain that ball lightning is anything more than a psychological phenomenon, but if it has objective reality it may possibly be due to causes similar to those outlined above: the presence of highly ionized gas, recombination of ions on catalytically acting solid particles which are held within the ball by their charges and the electric field at the surface of the ball.

IRVING LANGMUIR,
C. G. FOUND,
A. F. DITTMER

RESEARCH LABORATORY,
GENERAL ELECTRIC CO.,
SCHENECTADY, N. Y.

THE RACIAL ORIGIN OF ALMSHOUSE PAUPERS IN THE UNITED STATES[1]

DURING and since the war our lawgivers seem to have been more concerned about the racial heterogeneity of the American people than for many years before. Under expert eugenic advice a new immigration law has recently been passed by congress, care-

1 Papers from the Department of Biometry and Vital Statistics, School of Hygiene and Public Health, The Johns Hopkins University, No. 110.

fully calculated, so that body and the public were told, to make relatively easy the coming of "desirable" racial elements, and relatively difficult the entrance of "undesirable" racial elements. The soundness of the foundations of the expert eugenic advice has been somewhat called in question by Jennings, Buchholz and various other persons who have taken the trouble to look into the evidence which was presented to congress, and which apparently, in some degree at least, influenced that body's action. But in any event the deed is done, and is widely hailed as a triumph of eugenics. Even with this political *fait accompli,* however, data on any aspect of race in the United States are always welcome.

These considerations, and some others, lead me to call attention here to some statistics very recently issued by the Bureau of the Census in an eight-page pamphlet entitled "Paupers in Almshouses: 1923." "These statistics relate only to inmates of public almshouses and do not include inmates of any other institutions or recipients of outdoor relief." In spite of this limitation the figures presented have a good deal of significance. I shall discuss here only one of the many interesting points which the figures raise, namely, the racial background of our public almshouse pauperism.

It appears that there were enumerated on January 1, 1923, 72,336 white paupers in almshouses, and 5,511 negro paupers in the same situation, these figures being, respectively, 92.6 and 7.1 per cent., or together 99.7 per cent. of all the paupers in almshouses at that date. Inasmuch as at the census of 1920 the negroes constituted 9.9 per cent. of the total population of the country, it appears that the negro certainly made no worse showing in respect of almshouse pauperism than the white, and in fact a somewhat though not greatly better one. The same thing was true in 1910. The decrease in the proportion of almshouse paupers to the total population between 1910 and 1923 was more marked in the case of negroes than in native whites, with which group of whites the negroes may most properly be compared; for while the number of native white almshouse paupers decreased from 65.0 per 100,000 of the same class of the population in 1910 to 59.8 in 1923 (5.2 points), the number of negroes in the same situation decreased from 63.9 per 100,000 of the same class of the population to 52.7 (11.2 points). Keeping in mind always the cautionary fact that these figures relate to paupers in public almshouses only, it would appear that any social indictment of the negro race, as a race, in respect of pauperism would probably be difficult to maintain.

Turning now to the whites, it appears that of the 72,336 in almshouses on January 1, 1923, 48,019, or 66.4 per cent., were native-born; 23,557, or 32.6 per cent., were foreign-born, and 760, or 1.0 per cent., were of unknown nativity. The corresponding percentages on January 1, 1910, were: For native-born 56.9 per cent., for foreign-born 42.6 per cent. and for persons of unknown nativity 0.5 per cent. These facts would appear to suggest that during the period covered a change has come about, which has had as its result a distinct diminution in the proportion of foreign-born to total white almshouse paupers. The available data furnish no means of determining the nature of the social forces which have produced this change. The fact, however, is interesting. It means that we were paying for the care of nearly 10,000 *fewer* foreign-born white persons in almshouses in 1923 than in 1910, while at the same time we were paying for nearly 4,000 *more* native-born white persons in 1923 than in 1910. Such meager comfort as is, insofar, derivable from this whole unfortunate situation plainly appears to be offered by the foreign-born and not the native-born.

But there is another statistical angle to the case which must not be overlooked, particularly as it is almost the only one that is commonly presented. While on January 1, 1923, there were in almshouses 59.8 native-born white persons per 100,000 of the same class in the population, the corresponding figure for the foreign-born was 173.6. This is by some regarded as a fact of dread significance. Perhaps it is. To me it seems possibly only an interesting expression of the difficulties which the human organism finds in adapting itself to a new environment. A high pauperism rate of foreign-born can, of course, be eliminated by so arranging matters that there are no foreign-born in the population. But in any circumstances which permit foreign-born persons to settle in this country, it seems probable that their pauperism rate will be higher than that of natives. Furthermore, the mental discomfort engendered by the higher foreign-born *rate* of pauperism would seem to be in some degree mitigated by the fact, already brought out, that we are, on the evidence, paying for the upkeep of a *decreasing absolute* number of foreign-born paupers in almshouses all the time. It is absolute mouths that it costs money to feed. High *rates* may be relatively inexpensive things.

Further light on this phase of the matter is afforded by the figures:

	Paupers in almshouses, enumerated on stated date, per 100,000 of the same class of the population	
	Jan. 1, 1910	Jan. 1, 1923
Native white	65.0	59.8
Foreign-born white	249.3	173.6

The decrease in the period is definitely more marked in the case of the foreign than in that of the native-born. This is made clear in Fig. 1, which is a ratio

TABLE I

COUNTRY OF BIRTH OF FOREIGN-BORN WHITE PAUPERS IN ALMSHOUSES, 1923

Country of birth	Foreign-born white paupers in almshouses		Per cent. distribution of foreign-born population of U. S., 1920	Difference between first and third columns
	Enumerated Jan. 1, 1923	Admitted during 1922		
	Per cent. distribution	Per cent. distribution		
All countries	100.0	100.0	100.0	
Northwestern Europe:				
England	8.0	7.2	5.9	+ 2.1
Scotland	2.6	2.5	1.9	+ 0.7
Wales	0.9	0.7	0.5	+ 0.4
Ireland	26.2	24.0	7.6	+18.6
Norway	2.0	1.5	2.7	— 0.7
Sweden	5.0	3.8	4.6	+ 0.4
Denmark	1.3	1.0	1.4	— 0.1
Netherlands	0.7	0.6	1.0	— 0.3
Belgium and Luxemburg	0.5	0.4	0.5	0.0
Switzerland	1.6	1.2	0.9	+ 0.7
France	1.5	1.2	1.1	+ 0.4
Central Europe:				
Germany	20.8	13.7	12.3	+ 8.5
Poland	4.4	6.4	8.3	— 3.9
Czechoslovakia	2.8	3.2	2.6	+ 0.2
Austria	1.9	2.7	4.2	— 2.3
Hungary	1.4	1.9	2.9	— 1.5
Jugo-Slavia	0.5	0.7	1.2	— 0.7
Southern and Eastern Europe:				
Russia	2.2	3.9	10.2	— 8.0
Lithuania	0.7	0.9	1.0	— 0.3
Finland	1.0	1.3	1.1	— 0.1
Greece	0.3	0.9	1.3	— 1.0
Italy	3.1	5.4	11.7	— 8.6
All other	0.6	1.4	1.8	— 1.2
America:				
Canada—French	2.5	2.9	2.2	+ 0.3
Canada—Other and Newfoundland	5.5	5.8	6.0	— 0.5
Mexico	0.8	2.7	3.5	— 2.7
All other	0.1	0.2	0.3	— 0.2
All other countries and unknown	1.2	1.8	1.3	— 0.1

chart on an arithlog grid, used to make the slopes of lines visually comparable.

The admissions during the year show the same thing as the enumerations. I have added the lines for admissions in Fig. 1, but will not take the space to give the figures.

Let us turn now to the consideration of the data which are the most interesting of all from the standpoint of human biology, namely, the figures which show the country of birth of the foreign-born white paupers in almshouses in 1923. Table I presents the essential material.

The figures in the last column of Table I are exhibited graphically in Fig. 2.

The table and diagram require little comment. With a few trifling exceptions, all the countries from which the present law *encourages* immigration contributed to almshouse pauperism in 1923 in *excess* of their representation in the population in 1920. On the other hand, again with a few trifling exceptions, those countries from which the present immigration law was especially framed to *discourage* immigration appear in the lower part of the diagram, because they contribute a *smaller* proportion to almshouse pauper-

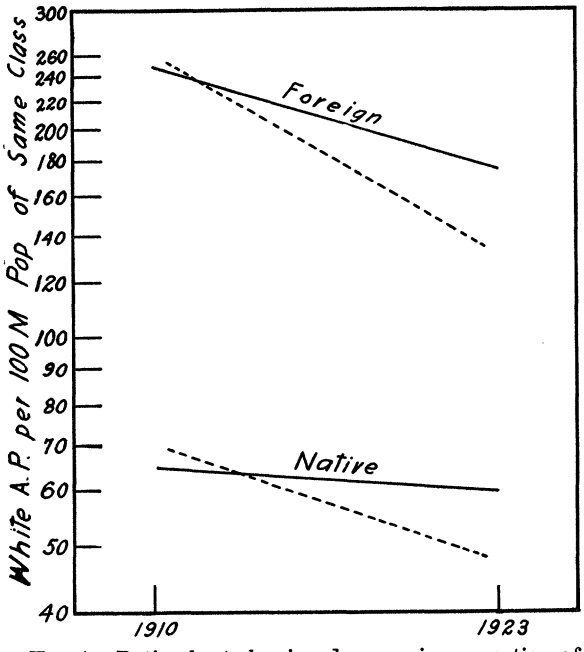

FIG. 1. Ratio chart showing decrease in proportion of almshouse paupers to the total population from 1910 to 1923. Solid lines, enumerated on January 1 of year; broken lines, paupers admitted to almshouse during years 1910 and 1922.

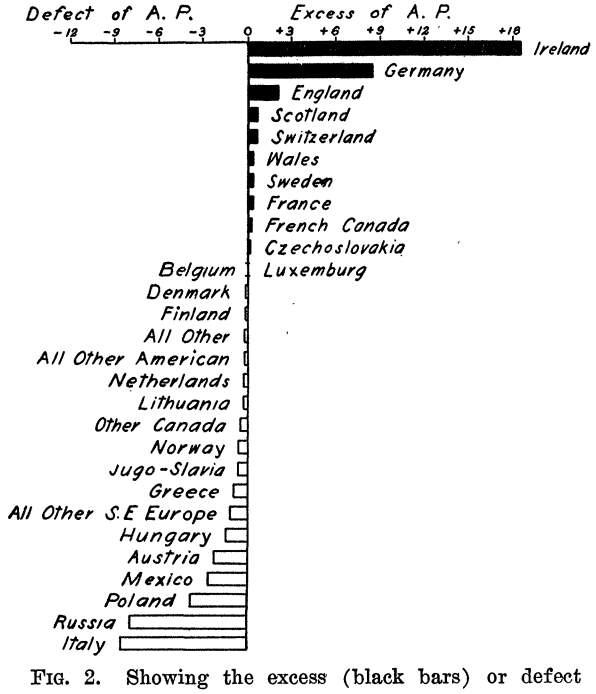

FIG. 2. Showing the excess (black bars) or defect (white bars) of the percentage presentation of different racial groups in public almshouses, as compared with their representation in the general population.

ism in 1923 than their representation in the general population in 1920. Immigration from five countries in particular, Austria, Mexico, Poland, Russia and Italy, has been subjected to much criticism. It is interesting to note that the immigrants from each of these five countries contributed proportionately *less* to our almshouse pauperism in 1923 than any other group of foreign-born people in the country.

RAYMOND PEARL
THE JOHNS HOPKINS UNIVERSITY

ROMEYN BECK HOUGH—1857–1924

WHEN an official or one connected with an outstanding educational institution ceases his scientific work, the fact is noted usually and his life effort is appraised. When, as an amateur, he has rendered comparable service to science, this is more likely to be overlooked.

Romeyn Hough is one whose contributions to a knowledge of North American trees ought not to be overlooked because his name may be sought in vain year after year in the bibliographic records of dendrology. He may never have appended his name to a specific binomial or a varietal trinomial. He may never have expressed in print curiosity even as to why some people put dogwood and peperidge into one family, while others consider them representative of two families. But, accepting the taxonomic and nomenclatorial views of those whom he felt disposed to consider authoritative on these vexed questions, he did very much to make it easier for people to become acquainted personally with our trees.

His interest in nature was not artificially implanted and skilfully nourished; it was inherited. Forestry as a national interest took form under his father, Franklin B. Hough. To father and son natural history was a matter of out-of-doors; the real thing appealed to them rather than its presentment. Before Romeyn entered college he knew a great deal of nature —the kind of nature-lore that few have and still fewer teach now-a-days. One of the privileges of my early years at Cornell was to get afield with him. Only last fall we recalled a never-to-be-forgotten example of mother love that a flying squirrel showed us nearly fifty years ago.

Hough never became a teacher: perhaps he was not drawn to the routine of pointing out to others what he found pleasure in seeking out for himself. He qualified as a physician, like his father; but he really became in a sense a manufacturer and publisher, combining avocation with vocation, for he manufactured structural sections—macroscopic and microscopic—of the trees that he knew so well.

Many years ago, Nordlinger issued a series of small thin cross-sections of German and exotic woods. I think that eleven centuries of these were issued. A