what relationship this resistance bears to the equivalent resistance of the complex network.

Although the experimental introduction to these two theorems is rather limited, it is felt that the experiment still serves several useful purposes. The student has been introduced to two theorems which otherwise would have been neglected. The introduction has been made without lecture prompting and thus may give one a measure of the student's ability to understand and use general theorems.

Method of Images—A Special Case

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THE first example of the method of images in electrostatics is always the problem of the point charge in front of an infinite conducting plane. This particular case can be solved quite simply and directly without the general formulation in terms of equipotential surfaces. Although only a special case, this solution may be useful in clarifying for the beginning student the role of the image charge (or charges) in simulating the field of induced surface charges in limited regions.

Consider the point charge $+q$ at a point P in front of a semi-infinite conducting region, $x>0$, as in Fig. 1. There being no field in the conducting region after equilibrium is established, by a familiar application of Gauss's theorem, no net charge exists in the conducting region. If there were no induced surface charges, we would have the field of the external charge uncancelled in the conductor, contradicting the basic postulate of zero electrostatic field in conductors. Thus, surface charges must exist, of such a magnitude and distribution, as to create a field E_s in the conductor cancelling the field E of the point charge q, for example, at point A in Fig. 1. But the surface charges exist on the plane, $x=0$, and therefore must create a field *symmetrical*

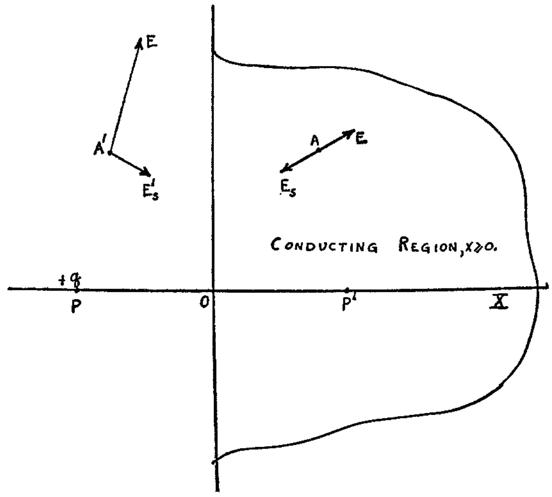

FIG. 1. Point charge in front of semi-infinite conductor. The field of the surface charges is symmetrical with respect to the surface charge plane, $x=0$.

with respect to this plane; so that at a point A', the image of A, the surface charge field must be the image of E_s, namely E_s'. Since the field E_s in the conductor is equivalent to that of a negative charge $-q$ at the position P of the original charge, the field E_s' must be identical to that of a negative charge $-q$ at P', the image of P. This establishes the nature of the surface charge field everywhere, and essentially completes the problem. It is also evident that this solution is unique.

One can also remove most of the chargeless conducting region, leaving an infinite conducting sheet of small thickness t in the region $0<x<t$. The solution obtained above is still the unique solution, if zero field is postulated for the now empty region, $x>t$; for, in this case, no surface charge can exist on the rear surface, $x=t$.

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LETTERS TO THE EDITOR

"Deposition"—a Proposed Antonym for "Sublimation"

PRESENT terminology of physics and chemistry includes just *five* terms for use in specifying the *six* possible types of phase transition that can occur between the three ordinary states of matter. In contrast to the antonymous pairs, "freezing-melting" and "condensation-evaporation," we have for the solid-vapor transition only the single term, "sublimation." In the writer's special field, the physics of cloud and precipitation, lack of the third antonymous pair has long caused considerable confusion, since all six possible types of phase transitions frequently occur simultaneously within ordinary rain clouds.

When one systematically examines usages in the literature of heat, thermodynamics, and physical chemistry, he finds the currently employed terminology for the solid-vapor transitions confusing and contradictory. It appears that physicists almost invariably use "sublimation" to mean only the solid-to-vapor change, while chemists may mean that or, about equally frequently, may imply a cyclic change that also embraces the subsequent return to the solid phase, as in the phrase, "purification by sublimation." Meteorologists, who took over the term from physics and chemistry decades ago, have evolved still another usage: They employ "sublimation" to mean either the solid-to-vapor transition alone, *or* the vapor-to-solid transition alone, and most frequently the latter! Thus, the meteorologist has come to speak of "sublimation nuclei," clearly a contradiction in terms from the viewpoint of the physicist; but the latter has nothing better to offer at present.

This confusion of meanings and the basic asymmetry of having only five terms for six distinct transitions should have been rectified long ago. Recently, I have discussed[1] the etymology of the term "sublimation" and have pointed out that its alchemical origin offers no helpful clues to the invention of any new terms. From consideration of several possible solutions, I conclude that meterologists should be urged to follow the physicists in restricting "sublimation" to just the solid-to-vapor transition, while for the inverse transition I recommend adoption of a new term, "deposition." Readers of this *Journal* who may have some doubt as to the appropriateness of such a new usage should refer to the cited discussion,[1] where a variety of passages from the literature of physics, chemistry, and physical meteorology are quoted to show that informal usage has, in fact, already given some currency to this meaning for "deposition."

In terms of the proposed usage, one would speak of the growth of crystals from the vapor as "growth by deposition" or "depositional growth." The "latent heat of deposition" would become the analog of "latent heat of condensation." The meteorologist would abandon the highly confusing term, "nucleus of sublimation," and would speak of a "nucleus of deposition." The ambiguous practice of using "condensation" to refer to a vapor-to-solid transition (a common practice in the current literature of solid-state physics) could be stopped.

In all, it seems clear that adoption by physicists, chemists, and meteorologists of the foregoing recommendation would eliminate a terminological difficulty that should have been corrected long ago by introduction of a distinct sixth term in the nomenclature of phase transitions. For this reason I am making the present recommendation in notes to several journals in the fields concerned.

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[1] J. E. McDonald, J. Meteorol. (to be published).

Physics in a Toy Auto

AN elegant demonstration of rotational kinetic energy is provided by a toy auto available in the 5 & 10 and toy shops for less than one dollar. The rear axle has a gear in its housing which engages another geared shaft forward of it, the gear ratio being about 10 to 1. The forward shaft passes normally through a heavy metal disk, the mass of the disk being nearly entirely in the edge. The vehicle is energized by grasping it bodily in one hand and running it rapidly with forward strokes on the table top, thus imparting high spin to the rear wheels. Or, with equal effectiveness, the rear wheels may be stroked rapidly with the fleshy part of the thumb. The heavy metal disk is thereby endowed with a substantial store of rotational kinetic energy. If, now, the car is set down on the table, its intrinsic rotational energy goes into translation, and the vehicle travels 10 feet or more in a line on the lecture-table top. It can, in fact, climb a grade.

Interestingly enough, if the car is given even a stout shove on the table top its translation is nearly instantly arrested, for reasons which are now obvious. Ask the class this question!

If the car is energized and set down on a glass desk top, the rear wheels spin for a time before the frictional force creates an acceleration of the car. The practical application of this (as in operating a motor vehicle on a slippery road) is interesting to students.

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RECENT MEETINGS

Chicago Section

The annual spring meeting of the Chicago Section of the American Association of Physics Teachers was held in the Science Hall of De Paul University on Saturday, April 27, 1957. Twenty-five members registered, representing nine institutions of higher learning and five secondary schools. President O. L. Railsback, University of Illinois, Chicago Undergraduate Division, presided. Luncheon was served in the new De Paul Alumni Hall. Following the afternoon session the facilities of the De Paul Physics Department were opened for inspection. Arrangements were made by Dr. Edwin J. Schillinger, Chairman of the De Paul Physics Department.

At the business session the secretary reported that the membership approved, by mailed ballot, a revised version of the constitution and by-laws. The revision was made by a committee composed of Harold M. Skadeland, University of Illinois, chairman, Herman J. Johnson, University of Illinois, and C. J. Overbeck, Northwestern University. As the new constitution called for election of officers in the fall, instead of in the spring as formerly, a motion to retain the present officers until fall was carried. The secretary, who is also the Chicago regional representative of AAPT, reported briefly on the January meeting of AAPT in New York City and transmitted various requests from national officers to the Section members. The following papers were presented during the day.

1. **The physics TV program in the Chicago area.** EDWARD C. SCHWACHTGEN, Science Consultant, Bureau of Curriculum Development, *Chicago Public Schools.*—Early in