with propriety be called a knowledge of Mechanics without the aid of Trigonometry. In the Composition and Resolution of Forces a few questions made specially to order, which usually depended on the facts that the sine and cosine of 45° are equal, and that the sine of 30° is ½—although, of course, the mention of a sine or cosine was inadmissible—exhausted the field; and the same restrictions were imposed on the treatment of Moments, so that I was obliged to abandon the task and to insist on a small knowledge of Trigonometry and the Sixth Book. In such a cramped and stunted knowledge there is nothing of spontaneity, nothing of power, but much of danger." It will be noticed that this criticism applies only to Dynamics. But as the study of other departments of Physics is based on that of Dynamics, the whole work of our class is shewn to be faulty, if this criticism is valid. Let us see then what it is worth. The only definite statement made is that in the discussion of the composition and resolution of forces, and in the treatment of moments, the range of illustrative exercises is so narrowed by the lack of Trigonometry that no spontaneity and no power can be developed in the student. Now (1) the great stress which Prof. Minchin lays on the sections of Dynamics to which he refers, seems to me to be an instance of the scrappiness of treatment, of which he justly complains as characterising most elementary dynamical text-books. For there are other sections of the subject admirably adapted to develop spontaneity and power, which do not involve either the composition and resolution of forces or the treatment of moments. It is true that in the older scrappy books these sections are very inadequately treated, but in more recent and more systematic books their treatment is as thorough as their importance demands. And for the sake of these portions alone Dynamics would seem to me to be quite worthy of study from an educational point of view. Even therefore if the above criticism were valid, and problems involving composition and resolution of forces incapable of adequate treatment without Trigonometry, the study of Dynamics without the aid of Trigonometry might still be vindicated, though certainly not according to the syllabus of the London University matriculation examination.

But (2) the number of available problems illustrative of the composition and resolution of forces and of the treatment of moments, though certainly narrowed by the lack of Trigonometry, is, I think, not narrowed to nearly so great an extent as Prof. Minchin imagines. The teacher is certainly not restricted for illustrations to cases in which the forces are inclined at angles whose trigonometrical ratios have simple values. For example, problems on the action of forces on bodies supported on inclined planes are available, provided the plane in each case is specified, as is frequently done in Engineering, by giving two of the three sides of the right-angled triangle by which it is conventionally represented. Such problems as the determination of the tensions in two strings, by which a heavy body is suspended from given points, are also available. And so also (to take a case involving moments) are such problems as the determination of the position of equilibrium of a beam resting on a horizontal rail with one end pressing against a vertical wall. Scores of such problems might be quoted, no more "specially made to order" than if they were couched in trigonometrical terms, and quite independent of the simplicity of the trigonometrical ratios for particular angles. The only problems which, so far as I can see, would not be available, are complex ones, the geometrical treatment of which would be practically too cumbrous.

Let it be noted also that the dynamical difficulties which are involved in the solution of problems are the same whether Trigonometry be employed in their solution or not. Hence the same spontaneity in grappling with dynamical difficulties, and the same power of overcoming them, are evoked in the student who solves them by geometrical methods as in him who is able to apply Trigonometry. Unless, therefore, Prof. Minchin is ready to maintain that spontaneity and power are the result of solving problems of the very complex kind only, his criticism falls to the ground. Such a position, however, would be quite untenable; for the simpler problems may certainly be made to present a sufficient array of difficulties to render skill and resource necessary for their solution. And, moreover, in at least a great many of the problems from which a student ignorant of Trigonometry is excluded, the main difficulty to be overcome is a mathematical one, and the chief power evoked by their solution is facility in dealing with trigonometrical formulæ. But Prof. Minchin himself, in the paper under consideration, protests, with as much force as justice, against making Physics a kind of disguised Mathematics. He cannot, therefore, regard it as an objection to any proposed mode of treating this subject, that it is inferior to another mode in the development of trigonometrical power.

So far as my experience goes, thoroughly accurate dynamical notions may be conveyed to students who know no Trigonometry, and quite sufficient power of dealing with the effects of the exertion of forces on bodies may be acquired by them, to serve as the basis for a valuable course of study in general Physics. They will, of course, find that in the application of their knowledge in special cases, they are continually