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Introduction by **Banesh Hoffmann**

Here is a stirring adventure in pure mathematics, a fantasy of strange spaces peopled by geometrical figures; geometrical figures that think and speak and have all too human emotions. This is no trifling tale of science fiction. Its aim is to instruct, and it is written with subtle artistry. Start it and you will fall under its spell. If you are young in heart and the sense of wonder still stirs within you, you will read without pause till the end is regretfully reached. yet you will not guess when the tale was written nor by what manner of man.

In these days space-time and the fourth dimension are household words. But Flatland, with it vivid picture of one and two and three and more dimensions, was not conceived in the era of relativity. It was written some seventy years ago, when Einstein was a mere child and the idea of space-time lay almost a quarter of a century in the future.

In those far-off days, to be sure, the professional mathematicians were imagining spaces of any number of dimensions. The physicists too, in their theorizing, were working with hypothetical graph-spaces of arbitrary dimensionality. But these were matters of abstract theory. There was no public clamour for their elucidation; the public hardly knew that they existed.

One would think, therefore, that, inorder to write Flatland, Edwin A. Abbott must have been a mathematician or physicist. But he was neither of these. True, he was a schoolmaster–a headmaster, no less, and a most distinguished one. But his field was classics, and his primary interests literature and theology, on which he wrote several books. Does this sound like the sort of man who would write an absorbing mathematical adventure? Perhaps Abbott himself thought it did not, for he published Flatland pseudonymously, as if afraid that it might besmirch the dignity of his more formal writings, of which he betrayed no reluctance to acknowledge his authorship.

Much has happened to our ideas of space and time since Flatland came into being. But despite all the talk of a fourth dimension, the fundamentals of dimensionality have not changed. Long before the advent of the theory of relativity, scientists thought of time as an extra dimension. In those days they regarded it as a solitary, isolated dimension that kept aloof from the three dimensions of space. In relativity time became inextricably intermingled with space to form a truly four-dimensional world; and this four-dimensional world turned out to be a curved one.

These modern developments have less significance than one might imagine for the story of Flatland. We do indeed have four dimensions. But even in relativity, they are not all of the same sort. Only three are spatial. The fourth is temporal; and we are unable to move freely in time. We can not return to days gone by, nor avoid the coming of

tomorrow. We can neither hasten nor retard our journey into the future. We are like hapless passengers on a crowded escalator, carried relentlessly forwards till our particular floor arrives and we step off into a place where there is no time, while the material composing our bodies continues its journey on the inexorable escalator–perhaps forever.

Time, the tyrant, holds sway in Flatland as in our own world. Relativity or no relativity, we still have only one dimension more than the creatures of Abbott's imagination; we still have only three spatial dimensions to their two. The inhabitants of Flatland are sentient beings, troubled by our troubles and moved by our emotions. Flat they may be physically, but their characters are well rounded. They are our kin, our own flesh and blood. We romp with them in Flatland. And romping, we suddenly find ourselves looking anew at our own humdrum world with the wide-eyed wonder of youth.

In Flatland we could escape from a two-dimensional prison by stepping momentarily in the third dimension and coming back on the other side of the prison wall. But that is because this third dimension is spatial. Our fourth dimension, time, true dimension though it may be, does not permit us to escape from a three-dimensional prison. It does enable us to get out, for if we wait patiently for time to pass, our sentence will be served and we shall be set free. That is hardly an escape, however. To escape we must travel through time to some moment when the prison is wide open, or in ruins, or not yet built; and then, having stepped outside, we must reverse the direction of our time travel to return to the present. Neither we nor the inhabitants of Flatland can travel thus through time.

Though the crowded years go by, this nigh-on seventy-year-old tale shows no sign of age. It remains as spry as ever, a timeless classic of perennial fascination that seems to have been written for today. Like all great art, it defies the tyrant Time.