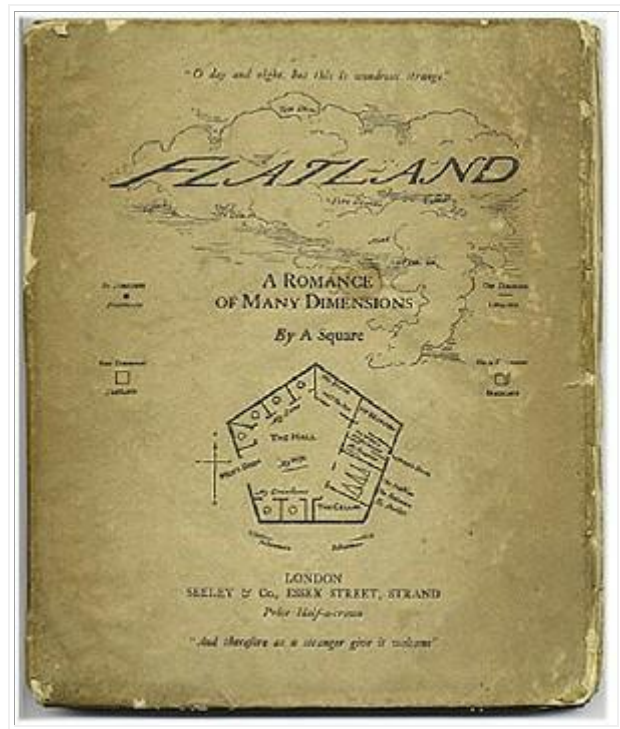


# Introducing Dimensions

As we watch through the lenses of a microscope, an amoeba goes about the course of its virtually two-dimensional life, confined to the narrow region between the slide and its coverslip. We observe from above as the amoeba moves around, encountering other creatures like itself, capturing food, and avoiding predators. Part of the cell membrane forms a line of defense entirely surrounding the amoeba and protecting its nucleus inside from threats by other creatures on the slide. But the words *inside* and *surrounding* do not mean the same to us in three-dimensional space as they do to the inhabitants of this nearly flat space. No amoeba in this space can ever come into direct contact with the nucleus of another. We, however, can look down from another direction entirely and see the very insides of the organism. Not only is the nucleus exposed to our view, but we can also poke it directly, a strange and disturbing event for the surprised amoeba. From our three-dimensional perspective, we visualize the world of the microscope slide in a totally different way than do its inhabitants.

One hundred and six years ago, a brilliantly conceived book exploited this fundamental idea of interaction between creatures of different dimensions to encourage its readers to break the bonds of limited perspective and open their minds to new ways of perceiving. Its author, Edwin Abbott Abbott, was a clergyman and the headmaster of a school in Victorian England. As a leader in the movement to provide educational opportunities for young men and women of all social classes, he was often frustrated by prevailing social attitudes and by establishment views in education and religion. Of his fifty books, the one that still speaks clearly to our own day is his little

masterpiece *Flatland*, simultaneously a social satire and an introduction to the idea of higher dimensions.



The cover of the 1884 first edition of *Flatland* not only invited the readers into realms of new dimension, but into the two-dimensional house of the book's narrator A Square. Although A Square can see only one room at a time, his house is totally open to our view.

*Flatland* describes an entire race of beings who are two-dimensional, living on a flat plane, unaware of the existence of anything outside their universe. How they lived and interacted and communicated is a fascinating story, and the narrator, A Square, does an excellent job of interpreting his society and his world to us living in what he calls "Spaceland." His task is prodigious, because as difficult as it is for

