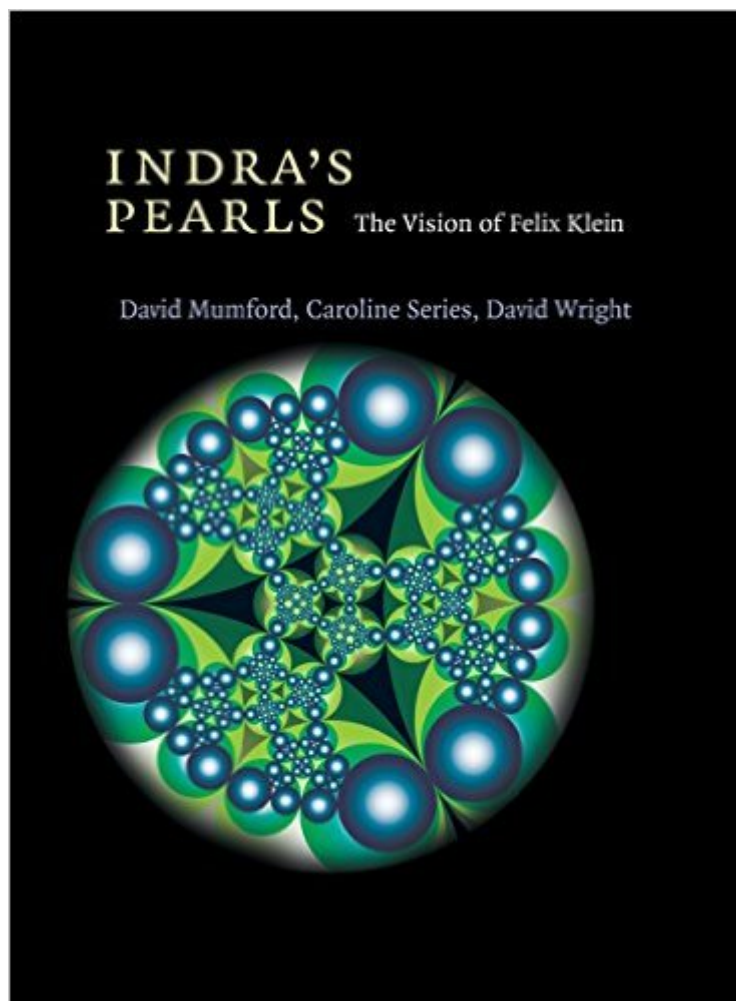


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# Indra's Pearls: The Vision Of Felix Klein



## Synopsis

Felix Klein, a great geometer of the nineteenth century, rediscovered an idea from Hindu mythology in mathematics: the heaven of Indra in which the whole Universe was mirrored in each pearl in a net of pearls. Practically impossible to represent by hand, this idea barely existed outside the imagination, until the 1980s when the authors embarked on the first computer investigation of Klein's vision. In this extraordinary book they explore the path from some basic mathematical ideas to the simple algorithms that create delicate fractal filigrees, most appearing in print for the first time. Step-by-step instructions for writing computer programs allow beginners to generate the images.

## Book Information

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## Customer Reviews

[this review shall replace the already existing one]Indras pearls provides a very well-made introduction to the basics of the theory of discrete groups acting on the complex plane. The whole discussion on the related limit sets had been accomplished in such a hand-by-hand method. The reader starts from complex numbers and after he is led into the deepest concepts: Möbius transformations, limit sets of discrete groups (Schottky, Fuchsian, ...). These limit sets are related to another interesting topic in today maths: complex dynamics on the Riemann sphere (Julia sets, ...). As known, computer experiments had been fundamental for supporting complex dynamics and the successive success of this latter topic helped to promote and increase the interests for discrete groups too: in fact this book evinces already strong interest in the visualization and in the study of the properties of such limit sets since '80s, due to the efforts of the same authors. One of the major

points of attraction in Indra pearls is that all the theory had been helped by displaying a lot of detailed and colorful pictures which, aside the historical biography of the mathematicians that contributed to this theory, set this book as one of the masterpieces in this topic, for his lucid and fresh approach to basic concepts. In addition, the presence of amusing comic-strips, explaining some topological concepts on manifolds (for example), guarantees the easy-learning for the reader and also the approach, as imagined and completely accomplished by the authors. In this direction, it is clear how passion had been squandered by authors. The goal has been reached: finding an easy way to introduce the harsh theory of discrete groups. Interested readers will be rewarded and also excited. No doubts: this book strikes and it will be a corner-stone for present and future.

This is my first reading of this book. This is a book you can come back to. My first pass was to look through the beautiful images. I have somewhat superficially read the text. The book is well written. It has multiple levels and components. It is partitioned in a stepwise manner to proceed from Mobius transformations from circles to circles, then consideration iterated pair of Mobius transformation of disjoint circle pairs, then "kissing pairs" then more generalized approaches. The important properties (conformal orientation preserving mappings) are discussed. The classifications are explained and the relation of these properties to the dynamic (iterated) behaviour is discussed. This book fits well with Visual Complex Analysis. I found the later chapters difficult and hope to come back to them in the future when I have the happy confluence of time, mood and more education. Central to the book is the concept of the group and particular subgroups. Fractals, chaos, and other concepts from dynamical systems emerge from this book in a beautiful way. There are also historical vignettes of the key figures in the development of the subject. The pseudocode is well explained in words, then algorithm. I have only just started to play with this. On a second and subsequent readings I hope to work through the projects that the authors provide. This seems to have been a long labour of love for the three authors and their collaborators. My first read was a pleasure and motivator to learn more.

Indra's pearls provides a very well-made introduction to the basics of the theory of discontinuous groups acting on the complex plane. The whole discussion about limit sets had been accomplished in such a hand-by-hand method. That is, the reader starts from complex numbers and, after, he is taken into deepest concepts as Möbius transformations and so to discontinuous groups (Schottky, Fuchsian, ...). Limit sets of Kleinian groups are related to another interesting topic in today's maths: complex dynamics on the Riemann sphere (Julia sets, ...). The success of this latter topic helped to

increase the interests for discontinuous groups too. Indra pearls also witnesses and resumes the last twenty years of efforts spent for studying the properties of the limit sets. One of the major points of attraction in Indra pearls is that all the theory had been helped by displaying a lot of detailed and colorful pictures which, aside the historical biography of the mathematicians that contributed to this theory, set this book as one of the masterpieces in this topic, for his lucid and fresh approach to basic concepts. In addition, the presence of amusing comic-strips, explaining some topological concepts on manifolds, guarantees the easy-learning of the approach, achieved by the authors. In this direction, it could be evinced that authors were really enjoyed while writing. The goal has been reached: finding an easy way to introduce the harsh theory of discontinuous groups. Interested readers will be rewarded about their choice and also excited.

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