

电磁学与奇异介质：寻找圣杯

2002 - Electromagnetics and exotic media: a quest for the holy grail

1993 年, 其中一位作者在 Espoo 拜访了另一位 D 作者。

这是一个持续了近八年的探索的起点，并产生了 33 篇期刊论文。

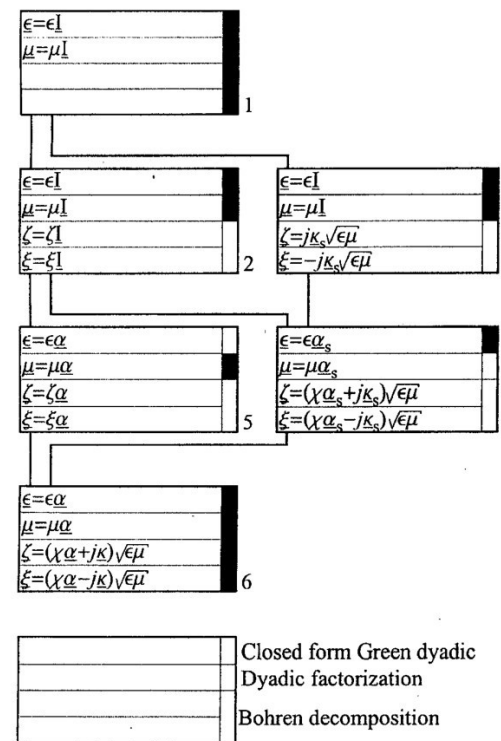
既然我们认为我们已经找到了“圣杯”，
我们决定写这篇文章来报道这场引人入胜的冒险。

1. Introduction

During the winter of 1993, one of the authors visited the other author in Espoo, Finland. This was the starting point of a quest that lasted for almost eight years, and resulted in 33 journal papers. Since we think we have found the “holy grail,” we decided to write this article to report this fascinating adventure.

Our quest deals with homogeneous bianisotropic media [1], i.e., infinite spaces filled with materials characterized by constitutive relations of the form

$$\begin{aligned} \mathbf{D} &= \underline{\varepsilon} \cdot \mathbf{E} + \underline{\xi} \cdot \mathbf{H}, \\ \mathbf{B} &= \underline{\zeta} \cdot \mathbf{E} + \underline{\mu} \cdot \mathbf{H}, \end{aligned} \quad \begin{pmatrix} E \\ H \end{pmatrix} = \begin{pmatrix} \frac{\eta_e^{(3)}}{\varepsilon_0} & \frac{\eta_{em}^{(3)}}{\sqrt{\varepsilon_0 \mu_0}} \\ \frac{\eta_{me}^{(3)}}{\sqrt{\varepsilon_0 \mu_0}} & \frac{\eta_m^{(3)}}{\mu_0} \end{pmatrix} \begin{pmatrix} D \\ B \end{pmatrix}$$



(Subscript 's' denotes symmetric part)

Figure 3a. The first main branch of the pedigree. This branch denotes the self-dual, or Bohren-decomposable media: the media that allow a dyadic factorization of the dyadic Helmholtz operator.

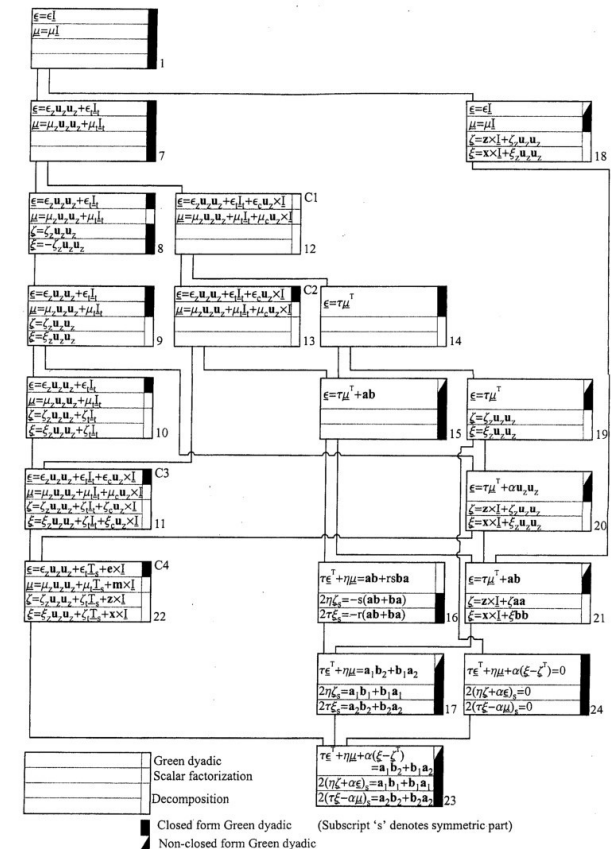


Figure 3b. The second main branch of the pedigree. This branch denotes the decomposable media, or media that allow a scalar factorization of the Helmholtz determinant operator.