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**Remarks on eigenvalues and eigenvectors of Hermitian matrices, Berry phase, adiabatic connections and quantum Hall effect.** (English) [Zbl 0841.58008](#)

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Summary: The singularities of the stratification of the space of the Hermitian matrices according to the multiplicities of the eigenvalues are described as an informal complexification of the previous study of the space of the real symmetric matrices. The degeneration of the spectral sequence associated to this stratification provides some strange combinatorial identities. The eigenvector bundles over the manifold of the Hermitian matrices with simple spectra are equipped with the natural connections, describing also the adiabatic approximation to the oscillations of the linear systems defined by the slowly varying skew Hermitian matrices. The curvature of this connection is singular at the codimension 3 variety of the Hermitian matrices having multiple eigenvalues. The resulting jumps of the integrals of the curvature form at the crossing of this variety by the moving surface of integration are responsible for the quantum Hall effect.

**MSC:**

- [58C40](#) Spectral theory; eigenvalue problems on manifolds
- [05E99](#) Algebraic combinatorics
- [58J99](#) Partial differential equations on manifolds; differential operators
- [81V70](#) Many-body theory; quantum Hall effect

Cited in **2** Reviews  
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**Keywords:**

[eigenvectors](#); [Berry phase](#); [adiabatic connections](#); [singularities](#); [stratification](#); [Hermitian matrices](#); [eigenvalues](#); [quantum Hall effect](#)

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