ABSTRACT DATABASES ON NATURAL SCIENCE

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A B S T R A C T

The purpose of the communication is to review the known and new results on abstract databases on natural science. The main examples are Zentralblatt MATH and Mathematical Reviews.

Content

РЕФЕРАТИВНЫЕ БАЗЫ ДАННЫХ ПО ЕСТЕСТВЕННЫМ НАУКАМ

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Введение

Целью сообщения является обзор известных и новых результатов о реферативных базах данных по естественным наукам на примерах Zentralblatt MATH и Mathematical Reviews. Обосновывается, что реферативные базы данных являются рабочим инструментом исследователей. В них, в отличии от Интернета, можно найти намного более точные, полные и что самое важное, обоснованные результаты.

1. Contents of Reviews

By Zbl: "A review of a mathematical work should give a *brief and clear account* of its contents. Reviewing papers in applied mathematics should concentrate on the mathematical aspects. Reading the review is not intended to be a substitute for reading the original paper; the primary purpose is to help the user to decide whether a he needs to read the original. The reviewer has, in principle, no responsability of checking the correctness or novelty of the original, but if he does discover that it contains a significant error or that it overlaps significantly with other work, he should mention the fact. *references* to related work are always appreciated (see section citations below)".

2. Example of a Review

Author:	*Yau, Shing-Tung and Nadis, Steve*
Title:	**The shape of the inner space. String theory and the geometry of the universe`s hidden dimensions**.
Source:	New York, Basic Books 355 p. (2010).

Meta data:
Primary Classification:
00A79

Secondary Classifications: 00A30 Philosophy of mathematics 81T30 String and superstring theories; other extended objects (e.g., branes) 51-02 Research exposition 83E30 String and superstring theories

83F05 Cosmology

Keywords: geometry; Calabi conjecture; geometric analysis; Calabi-Yau manifold; Ricci curvature; string theory; Ricci flow; nonlinear partial differential equations; Kahler-Einstein manifolds; Yang-Mills equations; gravity; shape of a space;

Review:

It is really justified to say that this book fills a gap between universe and geometry. Written by an outstanding (celebrated) researcher in geometry and his junior colleague-astrophysicist (astronomer) it gives a carefully written description of the main steams of the theories. Moreover, it includes a good amount of historical and classical concepts from dependable sources of information.

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The effort that lies at the heart of this book is the proving the Calabi conjecture by the first author.

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It is a great pleasure to review a work of such excellence and which does so much to promote the formation and applications of new geometric analysis branch of mathematics.

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The book is divided into fourteen chapters and includes also Preface, Prelude, Epilogue, Postlude and two poems. Each of the entry it is possible to read independently but full their beauty is discovering under the reading all the book. Chapters are excellent and do give a thoughtful view of why certain notions and methods are useful for commonly encountered and various particular questions and problems.

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Completely self-contained, the book starts with thorough discussion of geometry with respect to physics and Universe.

In Preface and Prelude authors formulate aims of the book, establish connections among mathematics, physics and their paths to the truth, express one’s thanks to their near relations and colleagues, show the coming of the shapes of things.

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In chapter one “A Universe in the margins” authors discuss Hubble, Planck and other possible volumes of our universe and give a historical sketch of it’s dimensional theories.

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Chapter two “Geometry in the Natural order” deals with main concepts of geometry and with applications of these concepts for probing the universe.

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Chapter three “A new kind of hammer” discusses geometric analysis tools used in mathematical investigations by C. Morrey, by S. Donaldson, by R. Hamilton, by P. Li, by G. Perelman and by the first author of the book under review. These include topics on partial differential equations in geometry and curvature, minimal surfaces, advances in four-dimensional topology, geometric flows, Ricci flows and Poincare conjecture.

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Chapter four “Too Good to be True” discusses the Calabi conjecture and demonstrates the third major success of geometric analysis related to the conjecture.

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Chapter five “Proving Calabi” contains ideas and description of the proof of Calabi conjecture by the first author. Topics on geometric analysis with applications and with more general results in the field were presented in the paper by S. Yau [Perspectives on geometric analysis, Surveys in Differential Geometry, Vol. X, Essays in Geometry, (2006; Zbl)].

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Chapter six “The DNA of String Theory” applies the results of chapter 3 – 5 to physics and string theory. The cases of zero, positive Ricci curvature and the negative curvature case and Kahler-Einstein manifolds are discussed. Five separate string theories (Type I, Type IIA, Type IIB, Heterotic SO(32), Heterotic E8 ×E8) and M-theory are briefly presented. The chapter contains an exceptionally interesting historical outline of the development of string theory up to our days.

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Chapter seven “Through the Looking Glass” deals with conformal invariance in a quantum setting, beta function and mirror symmetry. SYZ (Strominger-Yau-Zaslow) conjecture and homological mirror symmetry are discussed.

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Chapter eighth “Kinks in Space time” discusses singularities in our universe. These include black holes and their entropy, supersymmetry and Calabi-Yau manifolds, stable subsurfaces within the Calabi-Yau manifolds, developments of AdS/CFT correspondence by J. Maldasena [Adv. Theor. Math. Physics 2, 231-252 (1998; Zbl)], and the black hole information paradox. Aspects of AdS/CFT correspondence have considered by D. Serban [J. Phys. A: Math. Theor. 44, 83 pp. (2011; Zbl 1228.81242)] and by B. Vicedo [J. Phys. A: Math. Theor. 44, 183 pp. (2011; Zbl)].

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Chapter nine “Back to the Real World” takes up three topics. At first the Standard Model and it’s lacks are discussed. Then relations between the Yang-Milles theory and Calabi-Yau manifolds are considered. These involve possibilities of getting the right particles and trying to compute their masses. Third topic concerns with producing metrics for Calabi-Yau manifolds.

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Chapter ten “Beyond of Calabi-Yau” treats approaches to “a theory that works on all scales – a theory that gives us both particle physics and cosmology”. In the framework the shape moduli of a manifold with fluxes is considered. Then authors present the conifold transition, non-Kahler manifolds, their properties and applications. The Strominger equations which apply to non-Kahler manifolds, are discussed.

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Chapter eleven “The Universe Unravels ” discusses quantum tunneling, vacuum decays, thermal fluctuations, bubbles, compactification and decompactification of the extra dimensions. De Sitter space and its entropy is considered. “With ten spacetime dimensions to play with, and six new directions in which to roam, life would have possibilities we can’t even fathom”.

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Chapter twelve “The Search for Extra Dimensions” is devoted to the discussion of questions: Do string theory ideas actually describe our universe? “Do we have a player if verifying any of this – of gleaning any hints of extra dimensions, strings, branes and the like?”.

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In chapter thirteen “Truth, Beauty, and Mathematics” authors “do believe the best chance for arriving at a successful theory lies in pooling the resources of

mathematicians and physicists, combining the strengths of the two disciplines and their different ways of approaching the world. We can work on complementary tracks, sometimes crossing over to the other side for the benefit of both.”

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The last chapter “The End of Geometry?” is concerned with the comparison of classical and (possible) quantum geometry.

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Throughout the book there are many examples and figures which illustrate concepts and theories under consideration.

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The reviewer believes that the book is an excellent, clear, well-written presentation of the key ideas of geometry, string theory and the geometry of the universe’s hidden dimensions.

Ссылка на Review:

Zentralblatt MATH, *Springer-Verlag*.- 2012. *Режим доступу:* Zbl 1235.00025

3. References

By Zbl: “ **Example:**

B. H. Gross and *D. B. Zagier* [J. Reine Angew. Math. 335, 191-220 (1985; Zbl 545.10015)]

References to *books, reports, theses etc.* should be given in the form:

[author, original title or English translation title (Language) (series, publisher, city), (publication year; Zbl number (or leave space))].

Example:

J. Tate [Les conjectures de Stark sur le fonctions L d'Artin en $s=0$ (Prog. Math. 47, Birkhäuser, Boston) (1984; Zbl 545.12009)]

For other references give as many details as possible.”

4. Mathematics subject classification (msc2010)

Здесь содержится полная (для данного периода времени) классификация математических и естественных наук (существуют и другие классификации: УДК, PASC)

Заключение

Реферативные базы данных являются рабочим инструментом исследователей. В них, в отличии от Интернета, можно найти намного более точные, полные и что самое важное, обоснованные результаты.

Thank you for your attention!