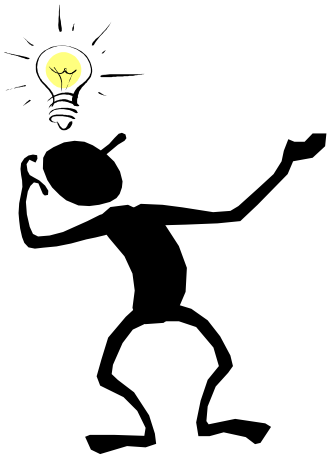
Introduction to Abstract Appreciation



Unusually Dense Crystal Packings of Ellipsoids

In this Letter, we report on the densest-known packings of congruent ellipsoids. The family of new packings consists of crystal arrangements of spheroids with a wide range of aspect ratios, and with density φ always surpassing that of the densest Bravais lattice packing $\varphi \approx 0.7405$. A remarkable maximum density of $\phi \approx 0.7707$ is achieved for maximal aspect ratios larger than $\sqrt{3}$, when each ellipsoid has 14 touching neighbors. Our results are directly relevant to understanding the equilibrium behavior of systems of hard ellipsoids, and, in particular, the solid and glassy phases.

Effective Scientific Abstracts

One of the first, and most important, things you will write as a grad student is a scientific abstract!

The abstract gives the reader a concise overview of the key motivations, methods, and results of the proposed research

Scientific abstracts are written for:

- Conferences and Workshops (e.g., APS April and March Meetings) you plan to attend
- Proposals you will write
- Journal articles you will write
- Prelim papers and theses you will write
- Seminars and Colloquia you will give

Importance of Effective Scientific Abstracts

An abstract serves to advertise your paper or talk:

Because the abstract is generally the first thing the reader will see, the quality of your abstract helps determine whether the reader will read your paper or attend your talk!

An abstract can determine if your proposal is reviewed!

Program managers often first review a 1-page “white paper” summary of the proposal to decide whether to consider the proposal for funding

Abstracts can be published or are available online and so are a permanent record of your paper or presentation

Published abstract booklets
Talk abstracts posted on-line
Paper abstracts available on INSPEC, SCOPUS, WOS,…

Writing an abstract can help you identify the key ideas in your paper/talk and the “story” or “elevator speech” you want to tell

If you can’t write a clear and compelling abstract, you probably haven’t thought through how to frame the main points of your paper!

Content of a Scientific Abstract

The abstract should contain (in this order):

1. A brief statement of the motivations and/or issues associated with the research
2. A short description of the methods used
3. A summary of the key results obtained
4. A statement of the implications of the key results

In short, the abstract contains the entire “story” of your research project in a shortened format!

Example of a Great Scientific Abstract

PRL 107, 117401 (2011) PHYSICAL REVIEW LETTERS week ending 9 SEPTEMBER 2011

Optical Response of Relativistic Electrons in the Polar BiTeI Semiconductor

J. S. Lee,[1,*] G. A. H. Schober,[2,3] M. S. Bahramy,[4] H. Murakawa,[5] Y. Onose,[2,5] R. Arita,[2,4] N. Nagaosa,[2,4] and Y. Tokura[1,2,4,5]

The transitions between the spin-split bands by spin-orbit interaction are relevant to many novel phenomena such as the resonant dynamical magnetoelectric effect and the spin Hall effect. We perform optical spectroscopy measurements combined with first-principles calculations to study these transitions in the recently discovered giant bulk Rashba spin-splitting system BiTeI. Several novel features are observed in the optical spectra of the material including a sharp edge singularity due to the reduced dimensionality of the joint density of states and a systematic doping dependence of the intraband transitions between the Rashba-split branches. These confirm the bulk nature of the Rashba-type splitting in BiTeI and manifest the relativistic nature of the electron dynamics in a solid.

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Motivation

The transitions between the spin-split bands by spin-orbit interaction are relevant to many novel phenomena such as the resonant dynamical magnetoelectric effect and the spin Hall effect. We perform optical spectroscopy measurements combined with first-principles calculations to study these transitions in the recently discovered giant bulk Rashba spin-splitting system BiTeI. Several novel features are observed in the optical spectra of the material including a sharp edge singularity due to the reduced dimensionality of the joint density of states and a systematic doping dependence of the intraband transitions between the Rashba-split branches. These confirm the bulk nature of the Rashba-type splitting in BiTeI and manifest the relativistic nature of the electron dynamics in a solid.

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Methods used

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Brief summary of key results

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Brief statement of implications of results

Celia Elliott's Abstract Recipe

Generate your abstract by answering the following questions, in one or two sentences each:

- What problem did you study and why is it important?
- What methods did you use?
- What were your principal results?
- What conclusions can you draw from your results, or what are the implications of your results?

Make your sentences as *specific* and *quantitative* as possible!!

More Advice from Celia

Control the length of your abstract by controlling the length of your answers to the four questions, NOT by omitting any of the answers:

Short abstract (~100 word, *e.g., Phys. Rev. Lett.* abstract):
one-sentence answers

Longer abstract (~200 word, *e.g., Phys. Review* abstract):
2-3 sentence answers

One-page abstract (*e.g.,* proposal project summary):
one paragraph answers

Additional Advice on the Abstract

Your scientific abstract:

Should involve well-developed, grammatical sentences and paragraphs

Don't take grammatical shortcuts just because it's an abstract!

Should be understandable by a non-expert audience

e.g., Avoid using specialized terms

Should be able to stand alone from the paper

Don't refer to figures in paper
Don't include references
Define all acronyms

Should NOT contain complex equations, figures, tables

Should NOT contain information NOT in the paper