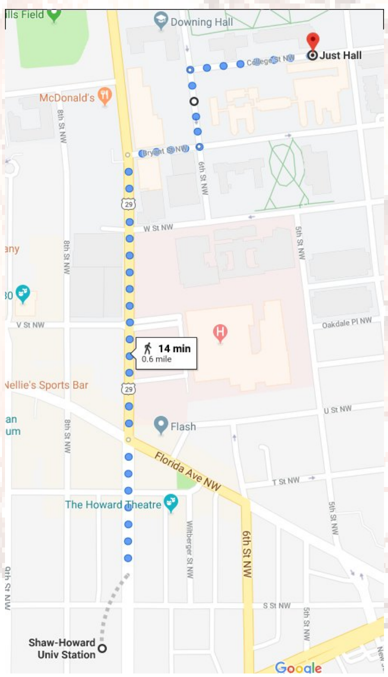
# Locations and Directions

**Auditorium**
The seminar will take place in the Auditorium of the Biology Department, Room G-09A, Ernest E. Just Hall, Howard University. The address of the building is 415 College St. NW, Washington DC. In the campus map
http://www.mobilemaplets.com/thumbnails/12600_thumbnail-1024.jpg
the Biology Department is number 7.

**Lunch**
Lunch will be served in Carnegie Hall, building number 12 on the campus map.

**Parking**
There is a free parking lot right next to the Biology building on College Street. Other free parking is available on other campus parking lots. All street parking is metered.

**Walking from metro**
You can reach the Biology Building with a 15 minutes walk from the Shaw Metro Station (Yellow and Green line):




# Baltimore-Washington

# Metro Area

# Differential Geometry Seminar

## Howard University

Saturday April 27th, 2019

Ernest E. Just Hall

Biology Auditorium, Room G-09A

Homepage:

`http://math.jhu.edu/~bernstein/MDGS/`

Organizers:

| Howard University | Johns Hopkins University | University of Maryland |
|---|---|---|
| Roberto De Leo | Jacob Bernstein | Yanir Rubinstein |
| Stanley Einstein-Matthews | Yi Wang | |

# Program

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|---|---|---|---|
| Reception and light breakfast | 10:00–10:45am | Lobby | |
| Introduction of Dean – **Bourama Toni**, Chair of Math Department | | | |
| Welcome | 10:45–11:00am | **Edna G.Medford**, interim Dean of COAS. | |
| Lecture 1 | 11:00–12:00pm | **Blaine Lawson** | *The Special Lagrangian Potential Equation* |
| Lunch | 12:00– 1:30pm | Carnegie Building, first floor | |
| Lecture 2 | 1:30– 2:30pm | **Peter Petersen** | *Alexandrov Spaces with Maximal Boundary* |
| Break | 2:30– 2:45pm | Break (Lobby) | |
| Lecture 3 | 2:45– 3:45pm | **Colleen Robles** | *What representation theory can tell us about the cohomology of a hyperkahler manifold* |
| Break | 3:45– 4:00pm | Break (Lobby) | |
| Lecture 4 | 4:00– 5:00pm | **Tristan Collins** | *Results in Strominger-Yau-Zaslow Mirror Symmetry* |

# Abstracts

**Blaine Lawson** (Stony Brook University)

The Special Lagrangian Potential Equation

*This is an equation which Reese Harvey and I found years ago, when we were first working on calibrations. It is a pure second-order differential equation for a scalar function, with the remarkable property that if u is a* $C^2$*-solution, then the graph of* $\nabla u$*, namely* $\{(x, \nabla u) \in \mathbb{R}^n \times \mathbb{R}^n : x \in \Omega^{open} \subset \mathbb{R}^n\}$*, is absolutely volume-minimizing in* $\mathbb{R}^{2n}$*. When* $n = 3$*, the equation has the very nice form* $\nabla u = \det(D^2 u)$*. This equation has received much attention over the years. I will give an introduction to the field and highlight some of the interesting developments including: the Dirichlet Problem, singular solutions, and the relation to mirror symmetry.*

**Peter Petersen** (UCLA)

Alexandrov Spaces with Maximal Boundary

*The talk will cover recent work with Karsten Grove about Alexandrov spaces with boundary. The questions are related to geometric versions of the "Positive Mass Conjecture". There are two interesting problems that we'll discuss: How does one bound the area of the boundary or the size of an Alexandrov space with boundary with only local conditions. What happens when the boundary has maximal area or the space has maximal size?*

**Colleen Robles** (Duke University)

What representation theory can tell us about the cohomology of a hyperkahler manifold

*The cohomology (with complex coefficients) of a compact kahler manifold M admits an action of the algebra* $sl(2, \mathbb{C})$*, and this action plays an essential role in the analysis of the cohomology. In the case that M is a hyperkahler manifold Verbitsky and Looijenga—Lunts showed there is a family of such* $sl(2, \mathbb{C})$*'s generating an algebra isomorphic to* $so(4, b_2 - 2)$*, and this algebra similarly can tell us quite a bit about the cohomology of the hyperkahler. I will describe some results of this nature for both the cohomology of O'Grady's 10-dimensional hyperkahler and Nagai's conjecture on the nilpotent logarithm of monodromy arising from a degeneration. This is joint work with Mark Green, Radu Laza and Yoonjoo Kim.*

**Tristan Collins** (MIT)

Results in Strominger-Yau-Zaslow Mirror Symmetry

*Mirror symmetry originally arose as a mysterious duality between Calabi-Yau threefolds, interchanging complex and symplectic structures. This duality has since expanded to include a much broader collection of objects, including Fano manifolds, and Landau-Ginzburg models. Two fundamental themes in mirror symmetry are (1) the existence of special Lagrangian fibrations, as conjectured by Strominger-Yau-Zaslow and (2) the correspondence between "stable" objects as predicted in work of Thomas-Yau, and Douglas. Here, stable objects are meant to be special Lagrangian manifolds on the symplectic side, and holomorphic bundles with canonical metrics, on the complex side. I will report on recent results in both of these directions. This talk will discuss joint works with A. Jacob, Y.-S. Lin, and S.-T. Yau.*