

CULTURAL PERSPECTIVES ON LEARNERS'  
PERFORMANCE & IDENTITY IN PHYSICS

PHYSICS EDUCATION RESEARCH CONFERENCE  
AUGUST 1-2, 2012  
PHILADELPHIA, PA



# PERC 2012: Cultural Perspectives on Learners' Performance & Identity in Physics

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As new research questions have emerged related to the variability of student reasoning and practices across contexts, the community has begun to attend to the relevance of culture and identity in physics learning. In conducting this work, the PER community has begun to draw from fields such as social psychology, anthropology, linguistics, and sociology along with new methodologies associated with these fields.

In particular, these fields offer new ways of thinking about performance. For example, achievement on various assessment instruments (such as FCI, problem-solving tasks, etc.) is a student performance that researchers and instructors commonly focus on. However, other student performances, such as how students talk and participate in ongoing classroom activities, can also offer valuable sources of evidence about understanding and development. Often, careful consideration of these different performances suggests different accounts of student understanding that are in tension with each other (or seemingly incongruent). Socio-cultural theoretical and methodological tools are useful in developing robust and coherent accounts of student understanding that span these different contexts.

The PER community has also begun to explore identity as a lens for understanding student development and participation in physics. Students' past patterns of engagement with other communities may offer productive resources for engaging in disciplinary practices. Similarly, students' engagement with other communities may also sit in tension with typical school science. From a socio-cultural perspective, identity is constantly a work in progress and enacted with others in cultural activities. This perspective draws attention to the fact that the people and artifacts around you influence (and therefore are partially responsible for) your identity and the performance enacted. Examining and characterizing identity in these ways involves drawing on data beyond the individual and using methodological tools that can account for this broader scope.

One of our goals in this conference is to highlight these emerging research directions and draw attention to the theoretical tools and methodological considerations of cultural practice perspectives on learning and performance. This conference will bring in national experts from these fields as plenary speakers, exemplify how these perspectives shape the methods, claims, and analyses of learning environments, and work to foster integration of these theoretical and methodological perspectives into the work of the PER community.

Organizers:

Ayush Gupta

Eleanor Sayre

Chandra Turpen

Jessica Watkins

Additional information on the PERC website:

<http://www.per-central.org/perc/2012/>

# PERC 2012: Schedule

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## Wednesday 1 August

3:30-6:00	AAPT/PERC Bridging Session	Inn at Penn Woodlands Ballroom
6:00-6:30	Poster Set-up	Houston Hall Hall of Flags
6:30-8:00	PERC Banquet	Sheraton Ben Franklin Ballroom
8:30-10:30	Contributed Poster Session	Houston Hall
8:30-9:30	<i>Odd-numbered posters</i>	Hall of Flags
9:30-10:30	<i>Even-numbered posters</i>	

## Thursday 2 August

7:30-8:15	Breakfast	Sheraton Ben Franklin Ballroom
8:15-10:45	Morning plenary session	Sheraton Ben Franklin Ballroom
11:00-12:30	Morning parallel sessions	Sheraton Breakout rooms
12:30-2:00	Lunch	Sheraton Ben Franklin Ballroom
2:00-3:30	Afternoon parallel sessions	Sheraton Breakout rooms

# PERC 2012: Plenary Sessions

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## **PERC Bridging Session: 3:30-6:00, Wednesday**

*Inn at Penn, Woodlands Ballroom*

Discussant: *David Hammer, Tufts University*

Moderator: *Leslie Atkins, California State University, Chico*

**Where do physics students come from and what do they become? A look at knowledge and identity pathways through and beyond school experience**

*Reed Stevens, Northwestern University*

**Practice-Linked Identities, Social identities, and Mathematics Learning**

*Indigo Esmonde, University of Toronto*

## **Morning Plenary: 8:15-10:45, Thursday**

*Sheraton, Ben Franklin Ballroom*

Discussant: *Noah Finkelstein, University of Colorado at Boulder*

Moderator: *Hunter Close, Texas State University–San Marcos*

**Cultural variations in epistemological orientations: Impacts on knowledge, meanings, and reasoning about the natural world**

*Megan Bang, University of Washington*

**When Everyday and Scientific Concepts Grow Into One Another: Syncretic and Connected Learning**

*Kris Gutiérrez, University of Colorado at Boulder*

Additional plenary information on the PERC website:

<http://www.per-central.org/conferences/2012/Presentations.cfm>

# PERC 2012: Morning Parallel Sessions

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## **Video Analysis Workshop: Reconciling Cognitivist and Interaction Analysis Methodologies**

*Workshop – Chestnut*

*Organizers:* Ayush Gupta and Andy Elby, University of Maryland, College Park; David Hammer, Tufts University; and Reed Stevens, Northwestern University

*Abstract:* Within learning sciences, tensions sometimes arise between researchers espousing cognitivist versus interactionist perspectives. Broadly speaking, the cognitivist perspective conceptualizes learning as changes in the form and content of knowledge in the head. The interactionist perspective, on the other hand, conceives of learning as a social phenomenon, embodied in the learners' talk, action, and interaction with other living participants and materials in a setting. This workshop is aimed toward the goal of seeking reconciliation between the perspectives. We will show two video clips, excerpts from video-taped problem solving done during a (i) clinical interview and a (ii) classroom small-group discussion. During the first half of the workshop, participants will unpack the phenomena observed in the videos. We expect that as a result of this observational emphasis, the participants, to varying degrees, will attend to the content of students' knowledge as well as to features in the interaction that become salient to the activity, including affect and situational identity. The second half of the workshop will be used for sharing and synthesizing analysis and comments, and reflecting on whether and how such close analysis of unfolding activity draws on and contributes to both perspectives.

## **Innovations and Issues with Conceptual Assessments**

*Poster Symposium – Ben Franklin Ballroom V*

*Organizers:* Rebecca Lindell, Purdue University and Lin Ding, The Ohio State University

*Abstract:* This symposium is focused on cutting edge research concerning conceptual assessments. It brings together four developers of concept inventories and the work they are doing probing new areas of interest in the development, use and dissemination of said assessments.

## **Shaping Identity through Membership in Communities**

*Poster Symposium – Fairmount I*

*Organizer:* Vashti Sawtelle, University of Maryland, College Park

*Abstract:* What do American cookies, Korean immigrants, Danish networks, and chemistry students have in common? Work on identity often focuses on how an individual perceives oneself without drawing attention to the role that an individual plays in larger community contexts. However, alternative interpretations on identity focus on the role of positioning within communities and how identities are shaped by interactions with members of those communities. This targeted poster session will focus on understanding what it means to be a part of a community of scientists and learners. The posters presented in this session use a variety of methodological tools and analytic lenses to investigate how communities form and invite members to participate. Each of the presenters will discuss the role that participation in these communities play in the shaping of identity for individuals and for the communities themselves.

## **Cultural Influences on Physics Teaching: Identifying Factors, Implementing Change**

*Poster Symposium – Fairmount II*

*Organizer:* Natan Samuels, Florida International University

*Moderator:* Benedikt Harrer, University of Maine

*Abstract:* Members of the PER community have recently been using classroom culture as a lens to examine current pedagogies, as well as to develop new and effective instructional methods. As such, many researchers are asking what makes classroom cultures productive? What beliefs, commitments, discourses, and practices do students and instructors bring into classrooms? How is the creation of a culture negotiated between its members? This session seeks to address these questions by presenting new findings from various physics learning contexts. Attendees will learn about: the influences of urban undergraduates' cultural background on teaching and learning physics, how a high school teacher's responsiveness to students' learning preferences changed her classroom instruction, how a group of physics graduate students enacts undergraduate courses that reflect their affirmative value system, and how evidence-focused labs and adaptations to a research-based curriculum influenced high school students' participation in scientific discourse. An interactive discussion will follow the presentations.

Additional parallel session information and abstracts on the PERC website:

<http://www.per-central.org/perc/2012/>

# PERC 2012: Morning Parallel Sessions

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## **Supporting and Sustaining the Holistic Development of Students into Practicing Physicists**

*Workshop – Penn I*

*Organizers:* Corinne A. Manogue, Elizabeth Gire, and Mary Bridget Kustusich

*Abstract:* This workshop expects to leverage the broad expertise inherent in the PERC community to begin structuring a research agenda that might guide future efforts to support the holistic development of students into practicing physicists. Participants will brainstorm the following questions in small groups and synthesize the results as a whole group. Conclusions will be summarized for the community in a proceedings paper.

- 1) What concepts, habits of mind, skills, and representations thread through the sub-disciplines of upper-division physics?
- 2) What are the characteristics of curricula that scaffold student acquisition of these concepts, habits of mind, skills, and representations throughout the upper-division?
- 3) What aspects of institutional culture might facilitate the development, support, and sustainability of these curricula?
- 4) What models of research are currently available to address the questions above and where are new models needed?

## **Next Generation Science Standards and the Physics Education Research Community**

*Roundtable Discussion – Penn II*

*Organizer:* Scott Bonham, Western Kentucky University

*Abstract:* The Next Generation Science Standards (NGSS) are currently under development by a multi-state collaboration. The NGSS are structured around core ideas in each discipline, cross-cutting concepts, and science and engineering practices. These standards will direct future state wide assessments and therefore K-12 science and physics instruction. Experience has shown that standards and the corresponding assessments can bring about both positive change and unintended consequences in K-12 physics education, in affected by the preparation of teachers, curricular materials available, and methods of assessment. In this roundtable discussion, we will collectively explore the impact of standards and assessment, discuss to what extent the educational goals of the PER community align with those of the NGSS, think about ways the NGSS could be leveraged to address our goals of improving physics education, and identify research, teacher preparation, materials and assessment development activities the community might undertake to support good adoption of the NGSS.

## **Reading of Scientific Texts as Means of Exposing Students to Authentic Disciplinary Practices**

*Talk Symposium – University I*

*Organizers:* Shulamit Kapon, Tel Aviv University and Edit Yerushalmi, Weizmann Institute of Science

*Discussant:* Ruth Chabay, North Carolina State University

*Abstract:* How to bridge the dynamics of scientific discoveries with teaching in an introductory physics classroom is a long standing challenge. In chemistry and biology the incorporation of scientific articles in the high school curriculum is a subject of recent inquiry and interest, whose goal is to expose students to authentic scientific processes and facilitate their enculturation into the discipline. However, such scientific texts are hardly ever included as part of introductory physics courses. This session presents examples of how physics instruction can integrate readings of scientific texts at the introductory level. The readings discussed here encompass contemporary research papers adapted to the introductory level, historical lab-notebooks and popular scientific articles of famous scientists, and computational codes. The session and the related discussion aim to scrutinize the instructional affordances of various types of scientific texts, the adaptation and instructional use of each kind, and the learning that takes place.

## **Adopting Theories and Methods from Outside PER**

*Poster Symposium – University II*

*Organizers:* Noah S. Podolefsky and Katherine K. Perkins, University of Colorado, Boulder

*Abstract:* PER has grown by drawing on theories and methods in cognitive science, psychology, sociology, and other fields outside of physics. PER has assembled these various perspectives into its own approaches to education research. In this session, presenters will describe their recent efforts to bring new approaches from outside of PER to their work. While varied in content, these efforts will converge along several themes: the scope, power, and limitations of these new-to-PER perspectives, as well as alignment between theory and methods. Presenters will discuss the process of adopting outside theories and methods to PER specific research problems. Participants can gain insight into the specific theories and methods used by presenters. Following the conference theme, we also hope to present a general case for how PER can benefit and grow by following its own tradition of looking outside itself.

# PERC 2012: Afternoon Parallel Sessions

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## **Identifying Identity: Using Video Analysis to Track the Dynamics of Students Identities in the Learning of Physics**

*Workshop – Chestnut*

*Organizers:* Luke Conlin and Lama Jaber, Tufts University

*Abstract:* This workshop concerns analytical and methodological challenges related to studying identity in physics learning. Identity encompasses macro-level categorizations (e.g., gender, ethnicity, academic major, etc.) as well as micro-level dynamics in face-to-face interactions. Here, we use video analysis to explore the intersection of macro/micro notions of identity, as they play out moment-to-moment in physics learning. We will consider the following questions: How do we identify and characterize markers of identity in video data? How do we bound salient moments where students' identities are influencing their interactions and vice versa? How do we empirically support claims pertaining to the role of identity in learning? We will approach these questions through collaborative viewing and analysis of video from classrooms and interviews. We begin with a large group discussion, followed by breakout sessions where participants work in small groups to analyze clips provided by collaborating researchers currently studying issues of identity in physics learning.

## **Social Hierarchies and Accessibility in Physics**

*Poster Symposium – Fairmount I*

*Organizer:* Geoff Potvin, Clemson University

*Moderator:* Robynne Lock, Clemson University

*Abstract:* The establishment of hierarchical social structures, either explicit and conscious or implicit and unconscious, can hinder student participation resulting in their marginalization and disengagement. As part of the regular process of education, students experience social hierarchies in their studies stemming from aspects of their "invisible backpacks" and from day-to-day experiences in the classroom. In this symposium, we explore how social hierarchies arising from both of these sources are formed and the implications for student engagement with physics, physics identity development, and physics participation. In the former case, the impacts of sociocultural factors (including immigrant generation and college generation) are examined with respect to physical science career interests. In the latter case, the effects of teacher practices including positioning and authoritativeness on student engagement and attachment to physics are studied. These results are important for understanding how social hierarchies can impede entry into physics-related fields and how to address these concerns.

## **Learning Assistant Model Variation and Emulation: Toward a National Research Agenda?**

*Workshop – Fairmount II*

*Organizers:* Valerie Otero and Kara E. Gray, University of Colorado at Boulder

*Abstract:* The Colorado Learning Assistant model has demonstrated effectiveness in improving learning gains, improving student attitudes, and in better preparing teachers to teach in K-12 schools, through CU Boulder studies. In this session, we explore the replication of such studies at other universities as well as the development of explanatory models for LA program effectiveness. Posters will present traditional measures of program effectiveness such as learning gains, attitudes, and DFW rates as well as how these measures play out with populations traditionally underrepresented in physics. Further, by in-depth case studies of LAs' experiences, their experiences in the pedagogy course, and their written and verbal reflections, we establish models of identity through participation that can help us understand why the program is effective and what it truly affects. Ultimately, by critically evaluating traditional measures of program effectiveness in light of explanatory models of LA program effectiveness, we seek to establish an agenda for future research on personal and social elements that are critical to the success of an LA-style program, or any program that capitalizes on the development of identity through participation.

Additional parallel session information and abstracts on the PERC website:

<http://www.per-central.org/perc/2012/>

# PERC 2012: Afternoon Parallel Sessions

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## **Beyond the Physics Classroom: Exploring Disciplinary Factors that Influence Students' Reasoning about Approximation, through Video Data**

*Workshop – Penn I*

*Organizers:* Danielle Champney, University of California, Berkley and Eric Kuo, University of Maryland, College Park

*Abstract:* Physics students are not only taking physics. When examining how students reason with concepts and tools in physics, it is productive to consider their reasoning and experiences with those same concepts and tools in other disciplines. An ongoing interdisciplinary research program is investigating students' reasoning about approximation, and the perceived discipline- and context-dependent factors that influence their choice and evaluation of different approximation practices. Interviewed students reasoned through a number of approximation problems designed to cue experiences from either math or physics. In this workshop session, participants will collaboratively explore students' orientations to Taylor series approximation through video interview data. The session will be grounded in the exploration of the many different ways that student strategies and approximation practices are tied to the disciplinary commitments that they perceive in physics and mathematics contexts, and how those perceptions drive students' engagement in and reflection on the practice of approximating, in general.

## **Logistics of (Inter)National Database of Assessment Results**

*Roundtable Discussion – Penn II*

*Organizers:* DJ Wagner, Grove City College and Sam McKagan, American Association of Physics Teachers

*Abstract:* The PER community has long been in need of a database where teachers can upload student scores on PER-based assessment instruments and get analysis of their results along with peer group averages to use as a measure of comparison. Such a database would also be a boon to researchers who could have access to large amounts of data from diverse institutions. The PER User's Guide (<http://perusersguide.org>) and Grove City College are collaborating to develop an assessment results database. Before putting this database on line, however, many logistical issues need to be addressed: usability, privacy concerns, IRB approval, authenticating users, concerns of assessment authors, etc. Anyone interested in providing input and feedback on this project is welcome to join the dialogue.

## **Finding a Home for All of Myself: Intersectionality in Identity Formation for Women of Color in Physics**

*Talk Symposium – University I*

*Organizer:* Apriel K. Hodari, Council for Opportunity in Education

*Discussant:* Megan Bang, University of Washington

*Abstract:* Intersectionality, coined by Kimberle Williams Crenshaw (in law) and pioneered by Patricia Hill Collins (in sociology), posits that minority women's experiences can amount to "greater than the sum of racism and sexism" (Collins, 1989; Crenshaw, 1989; Wei 1996). In this symposium, we will present four papers on the application of intersectionality to identity formation for women of color in physics. Katemari Rosa focuses on the life story of a single woman, as a vehicle for understanding intersectionality in physics identity formation. Angela Johnson and Heidi Carlone will apply their authoring science identity model to physics, illustrating intersectionality as an analytical tool. Lily Ko and Maria (Mia) Ong analyzed intersectionality in the lives of 23 women of color in physics and physics-related fields. Rachel Kachchaf, Apriel Hodari and Lorelle Espinosa discuss how these collective works inform politics and policy in the current STEM-focused education policy context.

## **Research on the Learning and Teaching of Thermodynamics: Insight from Many Perspectives**

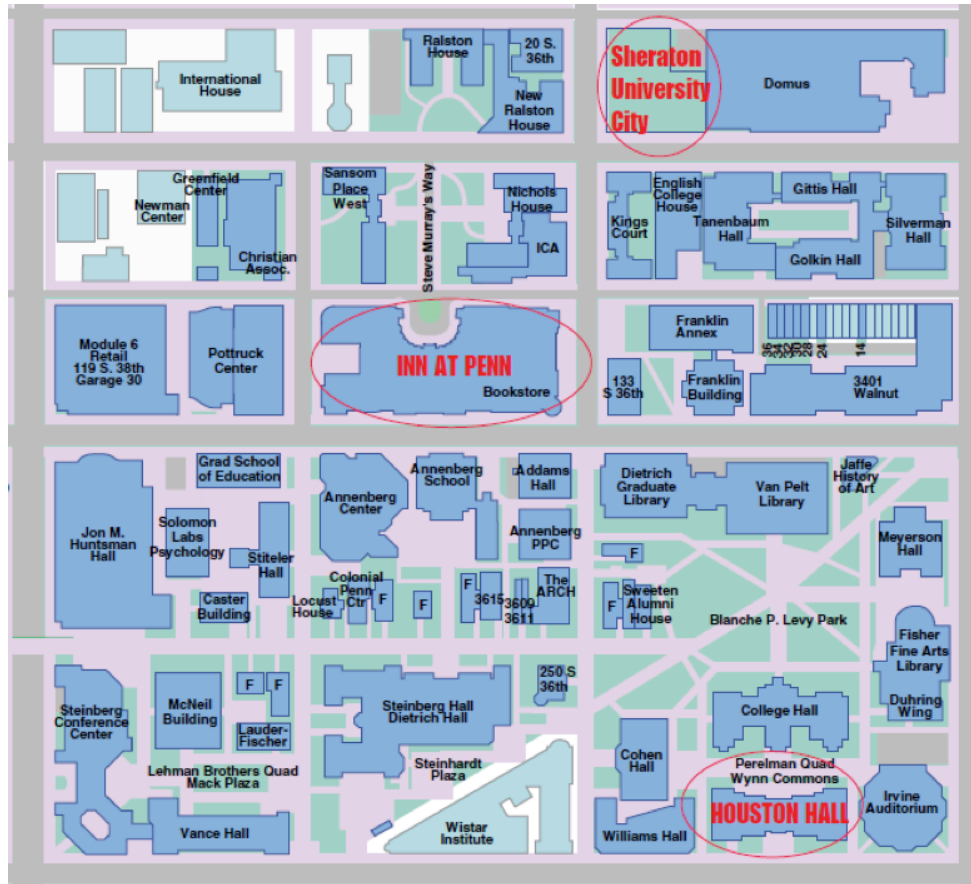
*Poster Symposium – University II*

*Organizer:* Warren Christensen, North Dakota State University

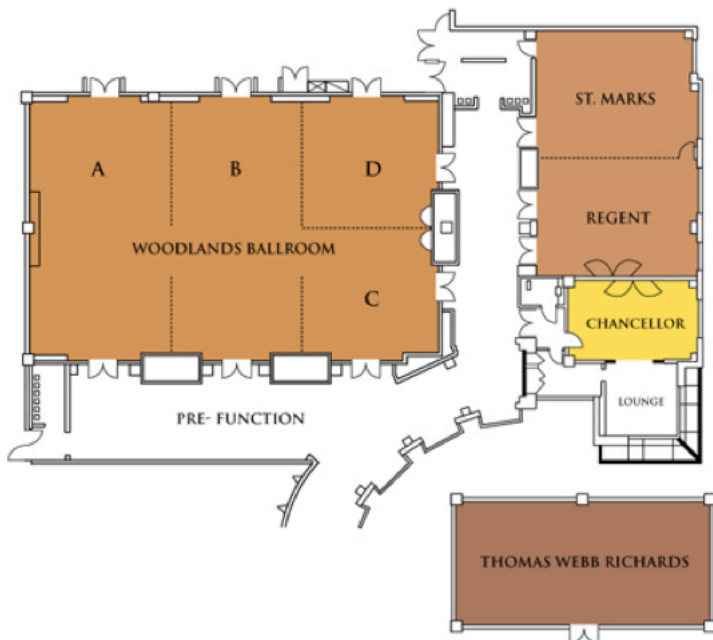
*Abstract:* Investigations into how what we should be teaching students about thermodynamics, when it should be taught, and how they think about it has occurred among middle school students up through physics faculty. This session collects a cross-section of some of this rich work for a holistic view of what we're trying to understand through our research in this area and what methods and frameworks can be employed to parse this significant area of research. Synergies across these invited posters will enrich our perspectives on the content itself, how others understand it and how we can effectively analyze it.



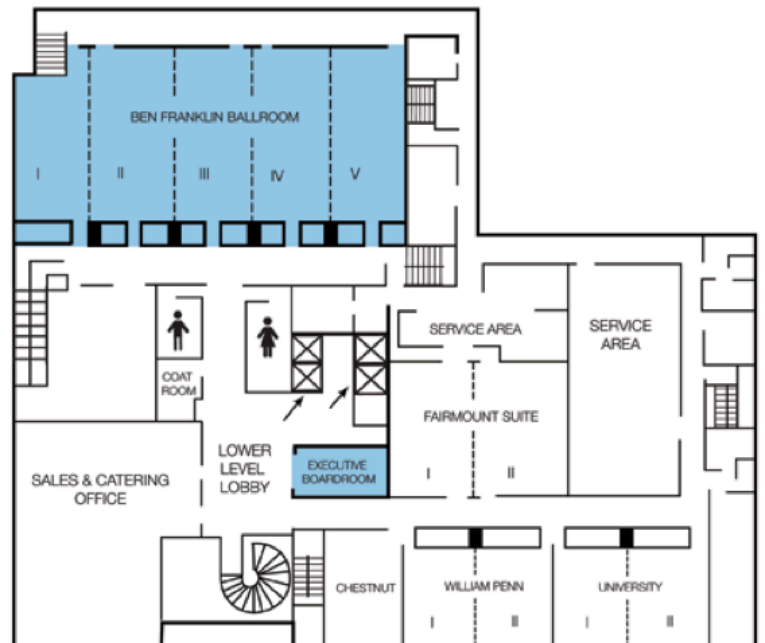
# PERC 2012: Map of Venue Locations



Inn at Penn floor plan



Sheraton floor plan

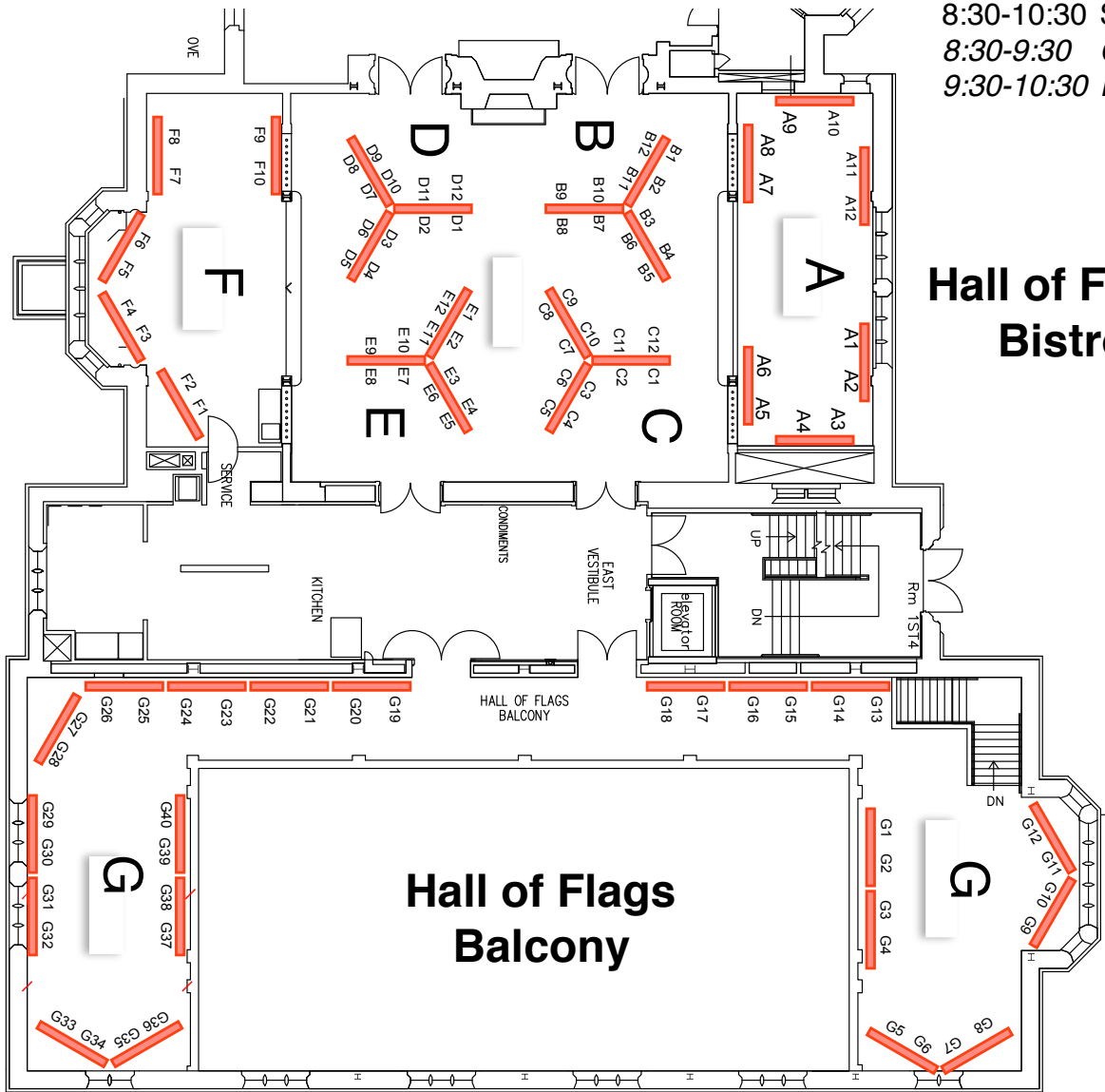


# PERC 2012: Contributed Poster Layout

8:30-10:30 Session

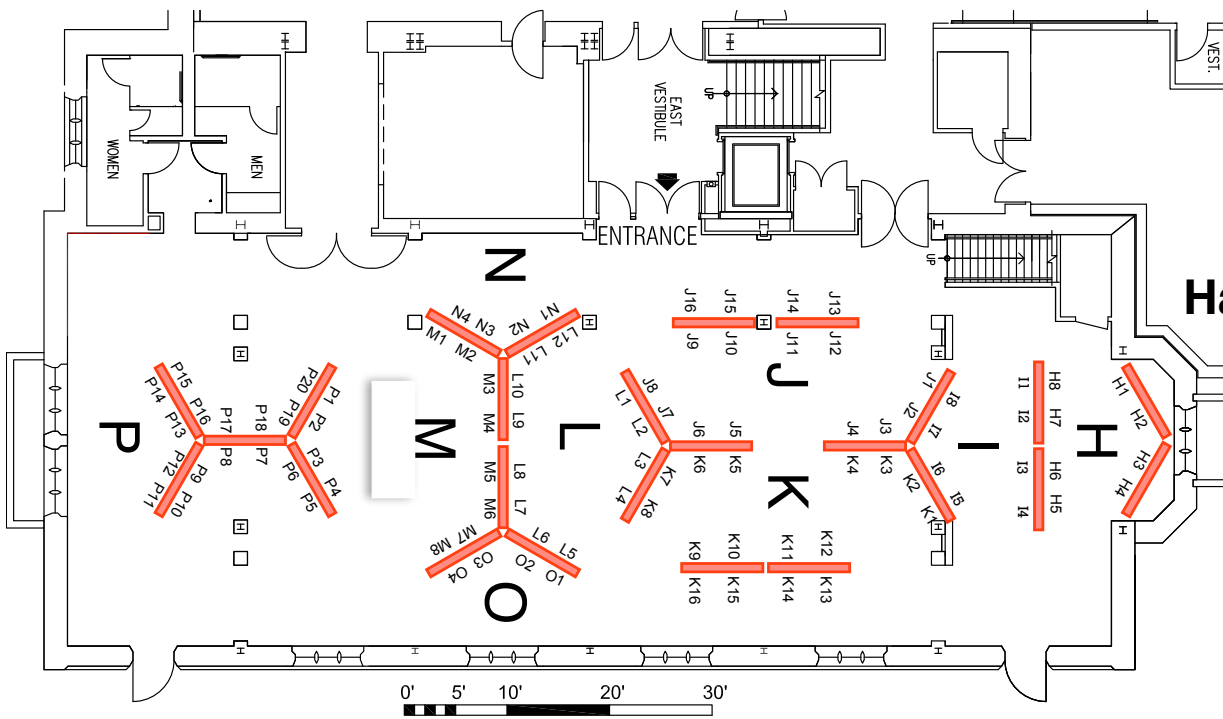
8:30-9:30 Odd-numbered posters

9:30-10:30 Even-numbered posters



**Hall of Flags  
Bistro**

**Hall of Flags  
Balcony**



**Hall of Flags**

0' 5' 10' 20' 30'  
SCALE IN FEET