

**Mathematical Contest in Modeling
Summaries, Pictures and Results
Simpson College
1999**



Nate, Heather and Cassie
concentrating on how to write the
paper.

Antarctic Impact

by

Nathaniel Iverson, Heather Layman and Cassandra Stubbe
Honorable Mention

The effects of a 1 km asteroid impacting on the South Pole are open to debate. To eliminate the need to know the actual mass and velocity of the asteroid, we modeled the energy of impact relative to size of asteroid, based on previous predictions. Then we determined different ways the energy could be transferred. For each of these ways, we determined what the results might be if all of the energy of impact was involved. This would be the worst case scenario because

the energy of impact is actually distributed among the means of transfer. We were actually surprised by our results. Rather than melting all the ice in Antarctica and raising the average ocean water level 65 meters, the complete energy of impact melted much less than 1% of the ice. Thus, only raising the ocean level an average of a few millimeters.

In our final analysis, we concluded that only secondary factors would cause any damage and that there is not enough evidence to know if these effects will even occur. From our estimates, damages could be billions of dollars and the casualties could range from a few thousand to a quarter of the world's population.

Unlawful Assembly

by

Lacey Christensen, Nate Miller and Tarrah Schlueter
Honorable Mention

Federal regulations determine lawful capacity for public facilities. It was our job to develop a model that would establish the appropriate capacity of a facility. We chose to base our model on criteria that would relate to this capacity. We created three groups in order to categorize different types of facilities. These groups were described as most restrictive, restrictive, and least restrictive. Data concerning existing facilities in each of these groups was collected. We found square footage to be the most contributing factor in determining capacity. It appeared that the other factors were already considered when the groupings were designated. A linear relationship was present when capacity was compared to area of a facility. *Maple V*, a mathematical software package, was used to graph this relationship and determine a line of best fit for the data using the least square method. We found a linear equation for each group. Finally, strengths and weaknesses were discussed concerning each group and our model in general.



Tarrah, Lacey and Nate work well as a
team.



Jesse, Justin and Judson take time out from their work to do a little clowning around.

Deep Impact

by

Judson Eastman, Jesse Hunt and Justin Pronga
Honorable Mention

We have formulated and analyzed a mathematical model of a 1-kilometer asteroid colliding with the Earth directly at the South Pole. The results of such an event would have massive effects on ocean level, weather patterns, the ecosystem, and life, as we know it. In the two cases provided, we found that the ocean level would rise 5.2 meters and 13.04 meters, depending on the density of the asteroid. Death tolls would be in the billions, land loss in the millions of square kilometers, and a massive weather system created with a reign of terror lasting several years. The model created is based on the energy of the asteroid and its destructive capabilities. Previous impact data and extensive

research were considered to determine some of the unlimited effects caused by an event of this magnitude.

Unlawful Assembly

by

Chad Cowden and Tim Hall
Successful Participant

We have been assigned the task of presenting a new method of determining the maximum occupancy of various kinds of gathering places. Included in this paper is our model of a method to do that.

In our discussion and description of the model, we bring up issues pertaining to the current process and also identify strengths, weaknesses, and other issues relating to both systems. Before attempting a solution, we worked on the problem. We decided that prior to any work involving answers is undertaken, the problem must be understood. While there are some details missing in our model of the problem, we believe simply including it was beneficial.

Following that, we have our model of the solution. The strengths include how our model uses the existing information of the current process, but is able to build on it creating a more standardized and fair procedure in finding a more accurate occupancy number. Our model recognizes that the current process may not be as applicable today as when it was first created. Perhaps the many changes over the years were not able to keep up.

It is wise to frequently ask, "Why?" "Why is the occupancy number for this room 215? Is that really the best number for all of the room's uses? What criteria were used and was that really the best way to accomplish the goal?"

Our model attempts to rectify the issues that arise as a result of answering these questions. Our model uses a somewhat standardizing approach involving more data, charts, and tables, as well as a more efficient use of the information already at hand. When implemented, we believe that a more accurate limit will be reached. The model is also very versatile, easily allowing fluctuations of occupancy limits for changing demands of rooms. As a side benefit, rooms will be designed and redesigned by architects to take full advantage of the benefits our model allows, such as constructing rooms in a more cost-efficient manner. The number of legal occupants will increase and the safety levels will actually increase as well. It is a win-win for everyone.



Tim and Chad build a model to determine safe occupancy rates.