California Science Center

CALIFORNIA STATE SCIENCE FAIR

2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.)

Stan Tolesnikov

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)

Can an Inverted Pendulum Sustaim Equilibrium?

Science Fair Use Only

S1412

Division

_ Junior (6-8) _X_ Senior (9-12)

Preferred Category (See page 5 for descriptions.)

14 - Physics & Astronomy

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)

Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

My initial objective was to determine wheather or not a pendulum in its upside down position, can sustain equilibrium. I reaserched this topic, and it became very evident to me that this phenomenonm is very posible to achieve. It turned out that a constant vertical driving fource, at a high amplitude, along with a pivot point should do the job. My next hurtle, consisted of building something that would do the job. I came up with using a typical jig-saw to provide the vertical driving force i need. I would then attach a rod to the tip of the saw with a free joint, and i had a primitive but very well working inverted pendulum. My next goal was to predict a driving aplitude for each lenght of the rods(7,13,20cm), using the theorem. I also derived a reliable way of measuring the frequency of the system. I used a petentiometer who's wiper was connected to the sysytem. One end of it was connected to a 9v battery while the other end was negative. Using a frequency counter i had a solid way of knowing the frequency of the system. Furhtermore, i determined what angle of desturbence that can be appliend to each rod, at various frequencies, for it to return to equilibrium. My result were almost exact with the frequencies i hypothesised, therefore concluding that not only can an inverted pendulum sustain stable equilibrium, but that the theorem predicts all it's variable precicely.

Summary Statement (In one sentence, state what your project is about.)

The purpose of my project, was to determine wheather an inverted pendulum, can sustian equilibrium.

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.

Brother helped with the idea. Friends helped in constructing the aparatus. Physics teacher on many others helped with moral suport.