

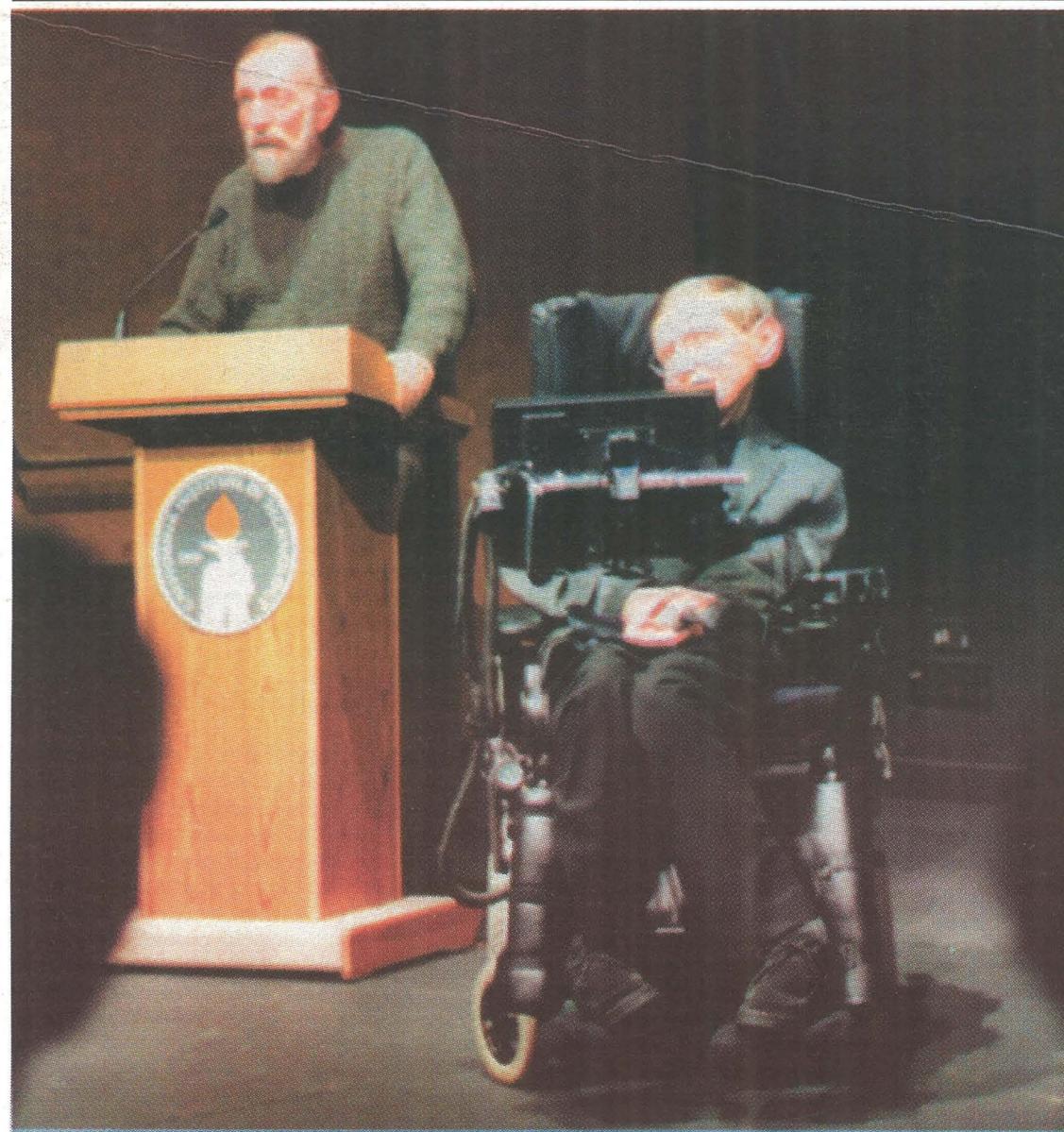


The California Tech

VOLUME CVI, NUMBER 12

PASADENA, CALIFORNIA

JANUARY 18, 2005



K. Peng/The California Tech
Professor Kip Thorne relates how he met Steven Hawking in 1965 before Professor Hawking gave his lecture 'To Boldly Go: My Life in Physics' to Caltech undergraduates in Ramo Auditorium.

Math Assists Crime Fighters In New CBS Drama 'NUMB3RS'

By ALEX SIEGEL

Few television shows have even attempted to capture the dynamic excitement of Mathematics. Just when most of us had given up hope that there would ever be a television show about math on a major network, "NUMB3RS" was created.

The new television series is about an FBI special agent and his genius mathematician brother who works at an unnamed university roughly based on Caltech. It can only be described as CSI meets Math2. Though not set to debut on CBS until January 23 at 10:00pm, Caltech was given a special sneak preview of the first episode last Monday in Beckman auditorium, followed by a panel discussion, and then a free dessert.

In the premier episode, FBI special agent Don Eppes, played by Rob Morrow, is working on a classified murder and rape case. Don tried to find a pattern in the culprit's attacks but to no avail. However, when his 30-year-old genius Mathematician brother, Charlie, played by David Krumholtz, sneaks a peak at a map of the crime scenes, he derives a formula that starts works backwards to estimate the neighborhood where the murderer lives.

Of course, the action isn't all on the chalkboard. There is plenty of violence, corpses, and the like to satisfy even the most arithmophobic viewer. The draw, however, remains

the mathematics. In fact, in the panel discussion following the preview, co-producers Cheryl Heuton and Nicolas Falacci admitted their passion for math. "We wanted to do a show about math, but needed the context of a tested show," confessed Cheryl. Thus, by combining the math genre with the more tested criminal law enforcement genre, they successfully pitched their new show to CBS, who Cheryl described as "wildly enthusiastic."

The first question on most people's minds seemed to be "Was the math even real?" Yes, for the most part, it was. Gary Lorden, Caltech's own Executive Officer of the Mathematics Department has worked as the Math Consultant for the show, in order to keep the show on solid mathematical footing.

In fact, the formula used in the first episode is used in the same way and for the exact same purpose as it was in the show. It was derived by a Canadian mathematician who successfully used it to determine the point of origin of a serial rapist and murderer in Louisiana. He now has his own business running his equation for people who want to locate criminals.

You may also wonder whether David Krumholtz, the actor who plays Charlie, the Mathematical genius, is even good at math. "You'll all be thrilled to know," he says, "that I failed Algebra I twice." Luckily, David sat in on a Caltech

math class or two during the first week of the Fall term to prepare for the role. Though it may not make up for Algebra I, it certainly helped David to understand what he calls "that passion for Mathematics" that I'm sure many students felt, at least during the first week.

Despite many requests, CBS decided not to mention Caltech's name in the series,

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D. Korta/The California Tech
Cast members Rob Morrow, David Krumholtz, and Judd Hirsch discuss their thoughts on the show as math professor and Math Department Executive Officer Gary Lorden looks on.

Hawking Describes Bold Life in Physics

By CHRISTINE CHANG

Silence fell over the darkened room as all attention was diverted to the man who was wheeled onto stage. The undergraduates gazed in awe at the one who can be considered one of the greatest minds in the world. Communicating through a computer-generated speech, Stephen Hawking delivered a speech titled "To Boldly Go: My Life in Physics," exclusively to undergraduates in Ramo Auditorium on January 14. In addition to his sharp intellect, the speech exhibited Hawking's wit and humor.

To introduce Hawking, Kip Thorne, a friend of Hawking since 1965, stepped up to the podium. "He has also survived so long and been so effective through personal grit, a combination of luck and personal grit," Thorne said. After listing Hawking's awards, including honorary membership into Dabney House, the internationally recognized physicist was brought onto stage.

Hawking began his lecture at his entrance into graduate school at Cambridge in 1962. There, he was assigned to Dennis Sciama. At that time, two fields of physics arose as particularly exciting: elementary particle physics and cosmology. Because elementary particle physics was too mind-boggling, says Hawking, he decided to study cosmology.

However, because of his lack of background in mathematics, Sciama suggested Hawking work in astrophysics. Hawking did not agree with this conclusion. "I came to Cambridge to do cosmology and cosmology I was determined to do," said Hawking.

Filled with resolve, Hawking began to study on his own and with the help of Sciama. However, it was at this time that he was diagnosed with motor neuron disease. He continued to work, however, believing that there was enough time for his to finish his doctorate. "The disease was not

Continued on Page 7, Column 1

progressing very much and my work fell into place," said Hawking.

Hawking then related a story where Hoyle, who had moved on to a new theory of a time-symmetric gravity, was giving a lecture. After the lecture finished, Hawking raised his hand and commented that this theory concluded that the mass approached infinity. When asked how he knew, Hawking replied that he had calculated it. The real truth, however, was that he had seen a draft of the paper in his office, which he shared with Neuricker. Hoyle was furious, but, says Hawking, he did not seem to hold a grudge, since he gave Hawking a job at his Institute later.

One of the theories of the day was the steady state theory, which assumed a constant density, but which did not have a firm theoretical basis. By 1963, the steady state theory was in trouble and when a faint microwave background was observed in the sky in 1965, the theory seemed to be coming to an end. "It was just as well I had not been a student of Hoyle because I would have had to defend the steady state," said Hawking. This new discovery aided Hawking in completing his doctorate thesis.

In January of 1965, Roger Penrose presented a new method of to prove an important theorem which did not involve solving field equations. Hawking realized that a similar argument could be applied to the expanding universe. Together, Penrose and Hawking set out to utilize this conclusion. "How refreshing to have a field all to ourselves. Unlike particle physics, where people were falling all over themselves to latch on to a new idea; they still are," Hawking said.

Hawking also related stories about his office from that time. "I used to have a bumper sticker 'Black Holes are Out of Sight' on

Downfall of Societies Studied by Diamond

By DAVID CHEN

Dr. Jared Diamond, a professor at UCLA and Pulitzer Prize-winning author of *Guns, Germs and Steel*, discussed on January 9 his new book that further explains his research in the history of various societies in a talk organized by the Skeptics' Society. His new book, *Collapse: How Societies Choose to Fail or Succeed*, details the fall of various societies in the past while tying in dilemmas facing the world today.

Dr. Diamond began by noting, "It's not the fate of all past societies to collapse. The question is why do some societies collapse and not others." He created a framework to analyze these causes, categorized in five areas.

The first, quite prevalent cause was abuse of the environment. For example, many ancient civilizations would over-fish or cut down too many trees. Furthermore, climate changes could strongly affect past societies.

Other human civilizations also affected the fates of past civilizations. Dr. Diamond noted that many historians continue to debate whether Rome's fall was caused directly by the barbarians or whether Rome was too weak internally. Besides hostile relations, friendly neighbors, such as trading partners, were important factors.

Finally, the response by the societies to emerging problems strongly determined their fates. The responses could include direct responses as well as indirect responses such as cultural changes.

Easter Island presents the "clearest case of humans hammering the environment." Since the nearest neighbors were far away, the fall of the society as Easter Island must have been from internal problems. Easter Island was a lush tropical forest when initially settled on. However, the inhabitants abused the island to such a degree that 23 tree species went extinct, leaving the island a barren desert and most bird colonies were killed off. Without even trees to build canoes and hunt in the ocean, the inhabitants had no way to obtain large quantities of meat. Thus, they collapsed in an "epidemic of cannibalism."

Easter Island presents a special analogy to the entire Earth, since to our knowledge so far, we are alone in the universe. In addition, like the inhabitants of Easter Island, we know of nowhere else to flee to. Thus the fate of Easter Island cautions against the abuse of the environment.

Dr. Diamond also mentioned another chapter in his book describing the fate of a pair of Polynesian islands. The populace of these islands themselves practiced sustainable environmental practices, but they relied on another island as a trading partner to obtain raw goods. Unfortunately for this pair of islands, the third island abused its ecosystem, collapsed in the Easter Island way and these two islands subsequently fell.

The story of the Vikings, who settled Greenland about 1000 AD, also is a separate chapter. Dr. Diamond noted that this society lasted for an impressive 430 years, but it eventually died off for all five possible causes. The Vikings deforested the island and the climate got colder. They also faced hostilities from Eskimo Indians and their main trading partner, Norway, weakened. Finally,

Vikings, who considered themselves good Christians, refused to learn from the pagan Intuit. This response by the Vikings made their fall inevitable while the Intuit continue to live today.

With all these collapses, Dr. Diamond mentioned one success story, that of Tokugawa Japan. After 150 years of civil war that ended in the 17th century, the shoguns were in control of Japan. They soon undertook many construction projects, to the extent that Japan was being deforested. The shoguns saw the problem, however and enacted policies to force conservation of wood, by using coal instead of wood for heating and by using less wood in new buildings. In addition, plantations of trees were managed so well that 74% of Japan's surface area today is forest.

There are a few reasons that societies may fail. The first possibility is a false analogy and as an example, Dr. Diamond explained that after World War I, the French decided to buy a fortified line of defenses. This Maginot Line, however, proved to be little hindrance to the German forces because the French strategists had falsely assumed that the Second World War would follow the same tactics as before.

Another cause for a society to fail is a failure to detect the problems. Dr. Diamond refers to this tendency as "creeping normalcy", or "landscape amnesia", when problems build up so slowly that they are not noticed. A prime example is global warming, which took about 20 years for us to confirm.

A final cause is a refusal to solve these problems. Oftentimes, there is a conflict of interest and Dr. Diamond gave the behavior of mining companies as an example, since they are interested in maximizing profits and this goal is accomplished by dumping toxic wastes into nearby water supplies. Also, a phenomenon termed the "tragedy of the commons" causes a failure to respond. For example, many fisheries today have been over-fished because it is difficult for all the independent parties to reach an agreement.

There are some bright spots. According to Dr. Diamond, companies, in contrast to the public's expectations, may sometimes find environmentally sound practices to help the bottom line. For example, on his trips to New Guinea, Dr. Diamond was surprised to see Chevron managing its fields in environmentally sound ways. He explained that after the various oil spills, oil companies have decided that it is "better off in the long run to be squeaky clean." Another example is Home Depot, which now gets all its wood from forests that are certified to be managed in an environmentally sustainable manner.

The big lesson, according to Dr. Diamond, is that problems of the population and environment have to be taken seriously. A serious issue is when the elite can insulate themselves. As an example, he noted that the Mayan kings did not suffer from the lack of water and failed to see the malnutrition among the commoners.

In contrast, he praised the Netherlands today for building dikes that protect everyone, rich and poor. Since the country is below sea level, every Dutch citizen works to maintain these dikes. Dr. Diamond noted his concern with



A. Green/The California Tech

Professors, USGS staff, and audience members converse about the Sumatra earthquake and subsequent tsunami after the briefing.

USGS Team Explains Tsunami; Pacific Coast Could Face Danger

By JON MALMAUD

On December 26th, a magnitude-9 earthquake originating from underneath the Indian Ocean sent forth shockwaves which circled the world and were felt as far away as Oklahoma. Shortly after, a tsunami ripped through the waters at jet-speed before washing up devastating amounts of water on the coasts of India, Thailand, and other Asian countries and islands. Casualties number approximately 160,000 and may double as disease takes its toll. Humanitarian aid has largely eliminated the risk of starvation but the relief program is estimated to be the most expensive in world history.

Luckily, Caltech is riff with experts eager to make the best of the situation. On Wednesday evening, a stuffed Beckman auditorium watched eagerly as a grand procession of geology pros gave their spin on the subject. After discussing the tsunamis tragedy, they also elaborated on the imminent danger to California and the link between nuclear bombs and Earth-shattering quakes.

First up was one Dr. Tromp, director of the seismology lab. He discussed the international network of monitoring stations scattered throughout the world. One reason why the tsunami was not detected is the difficulty in setting up underwater monitoring posts. They do have one such sea-bound station running in between Hawaii and California optimistically known as H_20. By year's end the UN plans to have an early-warning system in place for most of the Indian Ocean.

His talk focused on the so-called Finite Slip Model which

American society today, with the rise of gated communities, "with private security guards instead of the police, drinking bottled water and probably sending kids to private schools."

He also noted that today's globalized society could make everyone more vulnerable to a societal collapse because such a fall would be a global decline and not an isolated incident like Easter Island.

There is one big advantage that we have today, however. The people of Easter Island had no way to learn about such mistakes, whereas today we have books and satellite connections. "That was my main motivation in writing the book, that we would choose to learn," explained Dr. Diamond.

he demonstrated with fancy 3D animations showing two seismic plates slipping beneath each other and thrusting up vast columns of water with merrily proceeded the douse the unfortunate coastal lands.

The system relies on vast amounts of empirical data which is still being sampled from Sri Lanka. The information is transmitted to the Earth Simulator in Japan, formally the fastest supercomputer in the world at 10.4 Tflops, for number-crunching.

He went on to discuss the gigantic proportion of the tsunamic disaster. The last quake to equal the power ($2.0 \text{exaj}=2.0 \times 10^{18} \text{ J}$) of the one sparking this watery disaster occurred in Alaska in 1964. When the public audience started to become dazed with the seismic waveforms projected onto their retina, the professor made a useful analogy: "For those of you know who know quantum mechanics, it's just like hydrogen splitting."

Second at bat was Dr. Heaton. He starts by showing us a video of a flooding Thailand coastal village. At first we see a rather large wave crash onto the golden sand but it's not so unusual. What becomes alarming is that the wave fails to pull back into the ocean—it just keeps on flowing into town. Immediately after, a second and third wave adds to the now disturbing volume of water that refuses to return to its rightful place. As time goes on, it begins to look like the entire ocean is migrating, or rather stampeding, to a most unwelcome new home. A shot taken after the waters partially receded shows the wooden structures utterly razed.

Heaton goes on to note that magnitude 9 quake actually has 30 times of the much more common M8 but occurs only 1/10th as much. Thus scientists have "kinda gotten rusty at studying these things." His presentation was unfortunately cut short when Windows refused to demonstrate his model-generated animation.

Last up was Dr. Huddon, who discussed the effects of the disaster on the geography of the effected land. Much of the coast along the Indian Ocean will be permanently submerged beneath the waves while other lands and coral reefs will surface and die. Rice fields have been swamped with seawater, rendering the fields fallow for many generations. One helicopter conducting a scientific survey over the area

was pelted with arrows. In retaliation, Caltech is sending a grad there for fieldwork.

The seismopundits then sat down together to take questions. One inquiry was on the likelihood of a similar catastrophe striking our golden state. The answer was quite depressing; it's almost certain that a grand tsunami will flood the Pacific Northwest within several centuries. It would be deeply ironic if Caltech, a center of seismological studies, was destroyed. To prepare against this dreadful possibility, detailed seismological maps are being made of the area and sun-soaking Californians are being warned to leave the beach immediately if they feel an earthquake.

The remaining audience inquiries were perhaps not as sanguine but much more entertaining. One elderly gentleman pointed out that only very few animals died. Ergo, animals have an adaptation to sense incoming tsunamis and so should be studied vigorously. When it was pointed out that there is little Darwinian pressure to survive tsunamis and that very few animals live on the beach, his point seemed soundly rebutted.

A subsequent woman posited that perhaps the quake was caused by the detonation of a nuclear warhead. The professors thought it unlikely. Overall, though, the event was extremely enlightening and served as a reminder that we study at a university whose research saves lives.

The California Tech

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VOLUME CVI, NUMBER 12

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Reservations about Democracy in Iraq

By SIMON QUE

The first elections in the new Iraq are coming up soon. President Bush and his administration no doubt see this as a momentous event. Bush boasts in speeches about how "our commitment to democracy is tested in...outposts of oppression in our world," and how democracy in Iraq will bring freedom to the authoritarian regimes of the Middle East in a political domino effect. Yet we have reasons to be skeptical of what democracy will bring to Iraq. A look at past and present democracies suggests that democracy won't deliver the grand promises made by the Bush administration.

The historical evidence claims the contrary. Under Saddam, there was indeed a legislative body, the National Assembly, chosen by popular election. Yet despite this democratic institution, Saddam's regime still oppressed many people under it. His prisons were filled with political prisoners who had dared to oppose him. This questions the very notion that democracy will bring freedom, a notion championed by the current U.S. administration in its foreign policy.

Let's look into the mirror: how about in the United States, whose government holds popular elections? Consider some of the policies enacted by our democratically elected Congress. There's the recent PATRIOT Act that granted greater surveillance and search powers to federal agencies. Then there's the War on Drugs, which has given federal agents more opportunities to exercise their police powers and harass citizens for behavior that is harmless to others. The American people still tolerate these acts of the federal government.

The presidency, semi-democratically elected, doesn't have a good record either. President Franklin D. Roosevelt used the power of executive order for the internment of Japanese-American

cans during World War II. His ideological cousin, President Bush, signed an executive order that permitted trial by military tribunal of foreigners suspected of terrorism. Both presidents were elected with popular majorities after issuing the above executive orders, in 1944 and 2004, respectively. These are just a few examples of federal policies that have violated civil liberties in the U.S. repeatedly, despite democratic elections and popular support for the president.

Another claim made by Bush is that "...the reason why I'm so strong on democracy is democracies don't go to war with each other ... I've got great faith in democracies to promote peace," made on ABC News. Again, this seems to contradict reality. Didn't Iraq invade Iran in 1980 and Kuwait in 1990? Holding popular elections didn't stop Iraq from military aggression and conflict.

A similar observation can be made about the United States in the last hundred years or so. The US military has been an aggressor in many military conflicts during that time: The Spanish-American War, World War I (ironically fought to "make the world safe for democracy"), the bombing of Hiroshima and Nagasaki, the Korean War, the Vietnam War, Lebanon, Panama, Serbia, Somalia, bombings of Iraq, and the two Gulf Wars. These conflicts of dubious necessity or justification

have resulted in the deaths of millions of soldiers and civilians. It is interesting to note that starting in the late 19th century, shortly before the above list began, there

"While Saddam was in power, Iraqis could purchase all sorts of firearms on the streets of Baghdad. If they couldn't overthrow him themselves and wrest powers from the hands of a tyrant, maybe they aren't ready for self-government, freedom, and peace."

was a movement for more popular elections at various levels of government, culminating with the ratification of the 17th Amendment in 1913. This is not to say that these wars were necessarily caused by American democracy;

however, the growth of democracy clearly failed to "promote peace" and restrain militarism and intervention abroad.

Don't be too sure that democracy will bring domestic peace and stability to Iraq, either. One concern that some have expressed is the presence of the numerous ethnic and religious groups in Iraq: Kurds and Arabs, Sunni and Shiite Muslims, etc, and that they would use voting power to oppress each other. Examining a list compiled by the Federation of American Scientists of 29 recent conflicts within various states, such as Russia, Spain, Philippines, Indonesia, and Sudan, one counts 25 that were due to ethnic or religious causes. In 23 of these 25, the country in which it took place had a democratic form of government. Would Iraq become home to a 24th conflict?

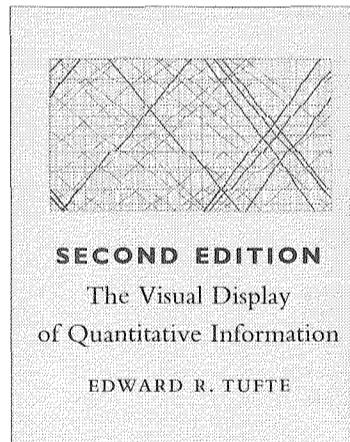
Concerns about conflict and oppression might be pacified by the constitution of Iraq, which contains provisions similar to our own Bill of Rights. They would protect the rights of minorities in case majoritarian oppression happens at the polls, right? Not necessarily. Such written provisions are as only good as the willingness of the people and their leaders to honor them. In the US, the Bill of Rights has been eroded in practice by compromise for the sake of security and centralized big government, most recently in the War on Terror. It is quite possible that terrorist attacks in Iraq

could undermine the rule of law there as well.

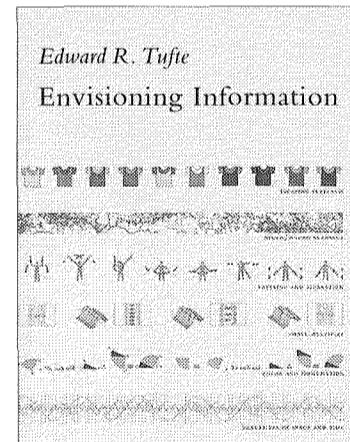
Lacking from the process of turning Iraq into a democracy has been real central involvement by the Iraqi people. The process has been mostly orchestrated by the US military and administration. (Bush decided for the Iraqis that Iraq would be a democracy. How paradoxical.) While Saddam was in power, Iraqis could purchase all sorts of firearms on the streets of Baghdad. If they couldn't overthrow him themselves and wrest power from the hands of a tyrant, then maybe they aren't ready for self-government, freedom, and peace. These things don't come from having the right political institution or documents but from an inner desire for, respect for, and understanding of them. Given that the Iraqis allowed Saddam to stay in power, it seems that they lacked these qualities. So why should we believe they would vote for freedom and peace over things like nationalism and national security?

The historical and empirical evidence casts much doubt on the claim that democracy will bring liberty and peace to Iraq. Both Iraq under Saddam and the history of the US suggest the contrary. But who knows how things will turn out in Iraq? There is no magical formula to determine what will happen once Iraqis go to the polls. So keep your fingers crossed.

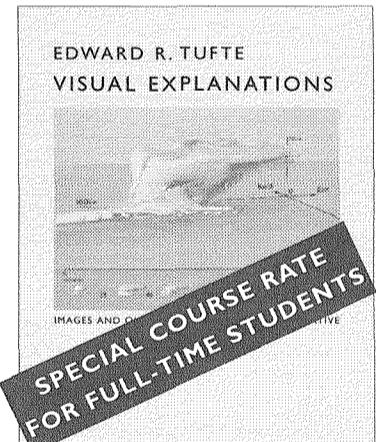
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Women's Basketball Takes Southwestern

By MIKE RUPP

Caltech Sports Information
Monday, January 10, 2005

Athlete of the Week: Women's Basketball's Lindsay King

The Freshman Forward from Bedford, New Hampshire set the school's single-game record with 33 points against Southwestern College on Friday night. King shot 12 of 20 from the field with six three-pointers; also a school record. She also had 11 rebounds, an assist, a steal and a block as Caltech snapped a six game losing streak going into conference play.

For the week, King average 15.3 points and 8.7 rebounds per game to go along with five blocks and four assists. For the season, she is Caltech's leading scorer and rebounder at 13.3 points and 7.5 rebounds per game. She also leads the team in blocks with 13, and is tied for the lead in assists and steals.

King will now lead Caltech into SCIAC play, beginning with this Thursday's game at La Verne.

Women's Basketball King's record 33 points leads Women's Basketball past Southwestern

Freshman Lindsay King scored a team-record 33 points in Caltech's 64-44 win over Southwestern on Friday night at the Braun Gym.

Freshman Jessica Roberts also had a tremendous stat line, with 20 points, seven rebounds, six steals, five assists and three blocks. Her 20 points and five assists were both career highs.

Junior Shelby Montague continued to provide tremendous rebounding (11 rebounds) and defense (three steals). Freshman Meghan Kelleher added six rebounds.

It was Caltech's second win of this season, with both victories coming over the Eagles of Southwestern. Earlier in the week, the team had suffered tough home losses to New Jersey City University and Stevens Tech.

For the week, Roberts averaged 11.7 points and 5.0 rebounds per game, with her seven steals, seven assists and five blocks all team highs. Montague averaged 8.3 rebounds with four steals. Sophomore Wing Ning thrilled her teammates and Caltech basketball fans when she scored her first career point off a free throw in the closing seconds against NJCU.

The team now begins its SCI-

AC Conference schedule. Their conference opener will be on the road at the University of La Verne this Thursday. Their next home game will be this Saturday against Claremont Mudd-Scripps. Tip-off is at 5:00 PM.

Men's Basketball

Men's Basketball competes at MSOE Invitational

The Men's Basketball team played at the 2005 Milwaukee School of Engineering Engineers Classic this past weekend.

Against the host Engineers, the team managed a one point lead at halftime, led by Junior Jordan Carlson's season high 18 points. But MSOE came back in the second half, and Caltech lost, 38-52.

Against Polytechnic University of New York, Carlson and Freshmen Paxon Frady and Bryan Hires each had nine points, as the team fell 47-62. Hires was the leading rebounder with seven boards.

Earlier in the week, the team suffered a tough loss at home to Colorado College, 39-53. The team was competitive for most of the game, coming within six points with four minutes to play. They committed only eight turnovers, the program's lowest single-game total in four years.

For the week, Junior Team Captain Day Ivy averaged an impressive four steals a game, running his season total to a team high 24. He also lead the team in rebounds for the week, was the second-leading scorer.

Carlson continues to lead the team in scoring and rebound with averages of 10.4 points and 5.6 rebounds a game. Freshman Bryan Hires has emerged as the team's second leading scorer, and leads the team in field goal percentage.

Their first game Their conference opener will be on the road at the University of La Verne this Wednesday. Their next home game will be this Saturday against Claremont Mudd-Scripps. Tip-off is at 7:30 PM.

Swimming & Diving fights through the rain and Pomona-Pitzer

The Swimming & Diving team battled through torrential downpour this past Saturday, as they hosted Pomona-Pitzer in a conference meet.

Junior Diver Bekah Eason had the top finishes for Caltech, winning the 1 Meter and 3 Meter diving competitions.

Senior Peter Seidel came in second in the 100 Freestyle with a time of :54.45 and third in the 50 Freestyle, with a time of :24.04.

One Fine (and Busy) Day: Don't Miss the Best Show on Television

By HARRISON STEIN

(Note: This article is Spoiler Free. Nothing revealed in this article will detract from viewing any of the four seasons of 24)

In an era dominated by reality television, a genre losing creativity and even more credibility by the second, the most inventive, enthralling and pulse-pounding show on television is Fox's 24 (Mondays at 9 p.m. Pacific). Despite massive defections among its cast members, 24 still packs a punch after three smashing seasons. Kiefer Sutherland has returned for a fourth season as Counter Terrorist Unit (CTU) Agent Jack Bauer, a man who has the longest days of his life when his country needs him the most.

24 debuted in subdued fashion in November 2001, as Fox refused to heavily promote a terrorist-related show so soon after the tragedies of September 11, 2001. Even though the show's premise was so clever, few analysts gave it a serious chance of survival. After the program premiered to sensational reviews and a massive audience, all 24 episodes were produced, with tremendous results.

The show's style is unlike anything else on television, as each season represents a day in the life of protagonist Jack Bauer. Consequently, each hour-long (or 42 minutes if you include commercials) episode presents an hour in that day, progressing in real time. The action shifts between countless subplots that develop throughout the season.

Although 2001-2002's Day 1 still represents 24's pinnacle of achievement, the subsequent seasons have never failed to exhilarate. In the first season, Jack faced the dual missions of thwarting the assassination of African-American presidential candidate David Palmer (cast regular Dennis Haysbert) and saving his kidnapped wife and daughter. Though the plot appeared to be resolved after hour 12, a newer, deadlier threat

emerged, and everything that occurred in the first half of the day took a backseat to what was to come. The last two hours of the season were the most thrilling, as a stunning twist added a whole new spin to the show.

In Day 2, Jack had to locate a nuclear bomb before it detonated in Los Angeles and in Day 3, he wildly searched for the source of the deadly, massively-contagious Cordella Virus before it could be released across



courtesy of <http://q13.trb.com/entertainment/>
The cast from season one of 24 take a break from their busy day to stop for a photo.

the country. The appeal of 24 is its unpredictability, as we never truly know where the plot is heading. Even though Fox has premiered four episodes of Day 4, the primary plotline of the season is still unknown, as most of the villains haven't revealed their identities nor their ultimate intentions. Every good guy, save Jack, has a reasonable chance of being a mole and every terrorist has an equal probability of being an undercover agent.

The plot might be the primary strength of the thrilling show, but the acting and directing is hardly second-rate. Kiefer Sutherland plays the entire show at one speed-fast, but the actions and emotions of his character are highly believable. Dennis Haysbert does a superb job portraying the powerful, yet undyingly ethical presidential candidate David Palmer, and his personal trials and tribulations are almost as captivating as Jack's everlasting adventures.

Sure, the show has its missteps, as the subplots involving Jack's precocious daughter Kim and David's quick-witted wife Sherry grow tired and ultimately detract from the show. In addition, if you skip one episode, you miss everything as it's virtually impossible

to catch up without missing some major plot developments. Fortunately, the first three seasons have all been released on DVD, and once the fourth is completed, it will join them.

Nonetheless, 24 hits far more than it misses, as its intense action scenes are infinitely entertaining. The camera work is astounding and it almost seems that we are fighting battles alongside Jack Bauer. The direction is also picture perfect, as each story transitions perfectly into another and the split-screen is expertly utilized. There is never a dry moment, as the last ten minutes of each episode are guaranteed to be action-packed. Even if a lot of the counter-terrorist lingo is way above our heads, it's always interesting to witness the agents and their highly advanced technology (even if it's fake) at work.

Television shows are produced much quicker than films because the product is typically inferior. This is not the case with 24, as I derive more pleasure from this action-extravaganza than I would from any Hollywood blockbuster. If you are willing find a way to catch every episode and don't have a heart condition, 24 is a roller-coaster well worth riding.

third place in the 100 Fly with a time of 1:00.17.

Sophomore Tom Jurczak competed in four events. He had a time of 2:27.61 in the 200 Free, a time of :24.59 in the 50 Free, a time of 1:08.22 in the 100 Breaststroke and swam the second leg of the 200 Medley Relay team which finished with a time of 2:13.18.

Senior Beth Dorman had a 1:24.97 time in the 100 Fly, a 6:42.46 in the 500 Freestyle,

and was part of the 200 Medley Relay team that posted a time of 2:14.99.

Junior Lisa Seeman had a 1:19.86 in the 100 Breaststroke and a :30.09 in the 50 Freestyle. She was also part of the 200 Medley Relay team.

Having shown it can swim in any weather conditions, the team will host Whitman College this Tuesday at the Braun pool. The meet begins at 3:30 PM.

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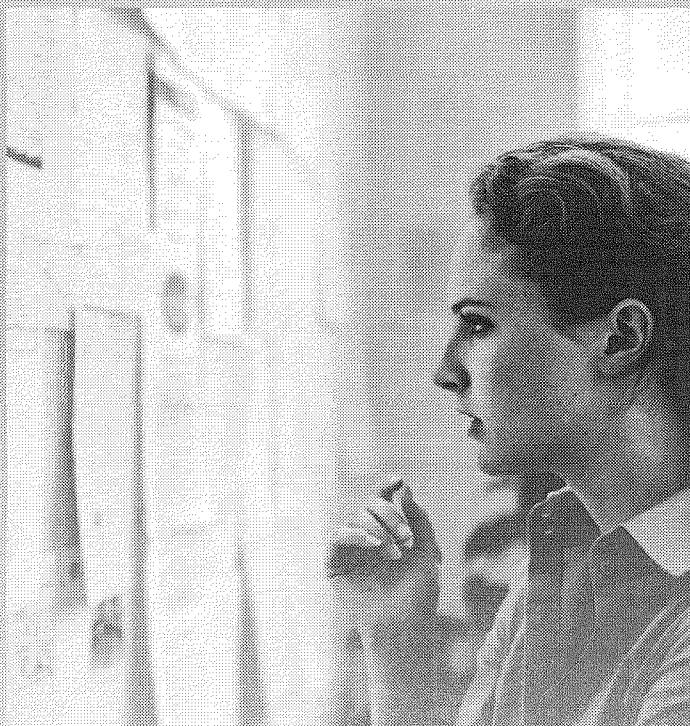
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Palo Alto, CA (AP) - A poll conducted by the Los Angeles Times showed that over 85% of first year grads believe getting high marks "is worth the effort" and "a valuable way to spend my time". Fewer than 10% of fifth year students felt the same way.

According to interviews with several current and past grad students, "grades don't count," said a grad student and now billionaire Jerry Yang, co-founder of Yahoo! Inc. "I got mostly B's in grad school, which at Stanford was really really bad."

In reality, neither employers nor grad schools care if you get an A or a B in your advanced Nonlinear Optimization class. "I'm just glad I don't have to pay for tuition any more," said a mother who wished to remain anonymous.

Reaction among graduate TA's was mixed with some expressing shock that their late hours grading amount to nothing, while others showed visible relief that losing a student's final exam will not really ruin their life.

Sources close to academic faculty reveal that this fact is well known among professors. "Of course grades don't matter," said Prof. Smith, "we only care about the lab work." Grades only serve to "feed the ego of the smart students, and break the spirit of the mediocre ones."



Papers Project by Correta Scott King in 1985. (for Dr. Carson's full bio visit

<http://www.stanford.edu/~Eccarson/>.

An overview of the week's event is listed below. For more detail about each event, visit <http://www.cpg.caltech.edu>

Tuesday / Video Presentation: I Have A Dream / 9 a.m.- 5 p.m., Various Locations

Wednesday / Keynote Luncheon-MLK's Vision for Civil Rights Today: Dr. Clayborne Carson / 12-1 p.m., Dabney Lounge

Thursday, January 20 / Common Struggles: Dr. King On Civil Rights, Peace, And Justice / 12-1 p.m., Red Door Patio

Friday, January 21 / Video Series Kickoff Luncheon & Discussion - Eyes On The Prize / 12-1:30 p.m., 2nd floor Center for Student Services

How to Improve Caltech Athletics

The Tech's Resident Humorist Shares His Ideas on Hiring, Recruitment, Girls and Increasing School Spirit (i.e. Girls)

By HAMILTONY FALK

Since my picks for last weeks NFL playoff games were so perfect that I've already predicted all of the games this week (counting only the game to be played between the Patriots and the Colts) I've decided to take a break on writing about football. Instead I'm going to write about football at Caltech.

We don't have a team.¹ Now that that's done with, I'm going to talk about the rest of the sports at Caltech. Gymnastics, Ice Hockey, Lacrosse, Rifle, Skiing, Men's Volleyball, Wrestling, Bowling, Field Hockey, Rowing, Softball. These are other sports that the NCAA has, but we do not. This is because Caltech likes to focus on the sports we do have, making sure we're competitive even if it means we can't devote resources to other things, like research.

This vast expenditure on sports, even to the extent of not buying lots of lasers and stuff for science, has really paid off. I think maybe the fencing team has more wins than losses? Or maybe that's golf? The other teams are almost as good, rarely failing to win a game for three or more years. The Caltech website has lots of praise for our intercollegiate teams, things like "The team was competitive for most of the game," "Congratulations to the whole team" and "Check back with us every week for the latest Caltech Athletics News and Highlights!" Of course there's no need to brag about our national champion chess team, world class c-ball club and our chess team which won a national championship, just like USC did.² Hopefully some players will be chosen in this spring's National Chess League draft.

I think it's pretty clear why

Caltech isn't as successful as it could be in athletics. For one thing we don't offer athletic scholarships to unintelligent skilled people. Another problem is that the average teacher is five feet tall, weighs 105 pounds and fears the great yellow orb in the sky. It is also a problem that no one has any time because of all the work and pain we have to go through to get middling grades and earn less money than graduates of Liberal Arts Colleges. Not that I'm bitter ever. Clearly this doesn't have to be the case, since other schools, like a certain school I won't name (that begins with an H, is located in Cambridge Massachusetts, and was founded by John Harvard), has rampant grade inflation, allowing students other focuses, like athletics. Or getting high paying jobs. This would of course undermine Caltech's academic reputation, but I don't care. If the administration decides not to do this, I believe that Caltech could improve its sporting success in other ways with a few easy steps.

Step 1: Begin recruiting current professional athletes. While these players would not technically be eligible to play under NCAA rules, Caltech has a large number of lawyers, and could probably make some sort of arrangement.³ This wouldn't be too difficult; the school would just need to offer an honorary degree that would help people like back-up L.A. Clippers or Tampa Bay Devil Rays players get a job when they're cut from their team. I also hear there are a lot of NHL Hockey players looking for something to do

Step 2: Recruit more girls. This would help us to have more girls, which could be on teams and stuff. In addition, Caltech would have more girls.

Step 3: Hire coaches that have

been successful elsewhere. I would recommend offering Steve Spurrier a rocket ship and robot slaves.

Step 4: Train animals to play sports. This might require use of our NCAA distracting lawyers again, but the biology department would surely be able to train some dolphins to join the swim team, some bears for football, and maybe a giraffe for the track and field folk.⁴

Step 5: Cancel Core. This actually wouldn't be that helpful for sports, but I really hate core.

Step 6: Robots. Robots play almost all sports better (the one exception is bowling), don't get tired, won't complain about playing time, and can kill opponents with their laser vision. With robotic teams, we could all watch large things we don't know, that are probably not intelligent enough to read a children's book, beat other teams at various sports. It'd be just like having a successful Division I football team!

If these steps are faithfully carried out, I can guarantee the Caltech as a school would win more athletic events, win them more often, and receive more national publicity for scandals in which boosters give large amounts of cash and possible illegal drugs to recruits. The school's self confidence would soar, and I'd have something better to write about than how we don't have very good athletics here. But I'm sure I could find something just as menial to write about.

1 But on a brighter note, we haven't lost a game since 1993!

2 Theirs was in football. Ours wasn't.

3 A little bribery and intimidation go a long way.

4 That's right; giraffes are really good at throwing javelin.

Saturday January 22 / MLK Service Project - Rebuilding Together or Boy's & Girl's Club / 8 a.m. - 5 p.m., Meet at The Caltech Y

The Cultural Programming Group (CPG) is comprised of representatives from The Women's Center, Human Resources, Minority Student Education (MSE), Admissions, Health Education, International Student Programs (ISP), and the Caltech Y. CPG regularly works with student groups as well as other campus departments to identify, promote, and engage the Caltech community on a range of cultural and current issues.

Caltech Counseling Center
The Caltech Counseling Center is

pleased to announce the 2005 Mental Health Lecture Series, featuring noted psychologists, therapists, and psychiatrists from the Pasadena area. This free and interesting series will cover a variety of topics of interest to the Caltech student community.

The first speaker will be Monday, January 24th from 12:00 noon to 1:00, in Winnett Lounge above the bookstore. Karin Meiselman, Ph.D., will give an interactive presentation

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January 2005 ASCIT Elections Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12 - 8 am: Signups for President and BoC Chair Open	13	14	15
16	17	18 - Today 5 pm: Signups Close	19	20	21	22
23	24 - 10 am to 10 pm: Voting for President and BoC Chair	25 - 10 am: Results announced	26 - 8 am: Signups for other offices Open	27	28	29
30	31	1 - 5 pm: Signups Close				

Hawking Concedes Defeat in Bet To Preskill; Thorne Holds Out

Continued from Page 1, Column 5

“It is like burning an encyclopedia. Information is not lost, but it is very hard to read,” Hawking said. Because he lost a bet to Preskill about whether information was lost in a black hole, he gave him a baseball encyclopedia. “I should’ve given him the ashes,” said Hawking, eliciting laughs from the crowd.

One night in 1970 a few days after the birth of his daughter Lucy, Hawking experienced a eureka moment. With the application of a certain theory, he could calculate how many states were inside a black hole while still allowing the black hole to appear the same on the outside.

By 1972, he had solved most of the problems in black hole theory except for cosmic censorship. This spurred a bet with Thorne and John Preskill, which Hawking conceded this summer. “I lost an earlier version of the bet by not being careful with the wording,” said Hawking. In return, he offered Preskill a t-shirt which featured a blonde woman wearing only red heels and a towel, with the words “Nature abhors a naked singularity” boldly exhibited on the towel.

Hawking found in 1973 that there seemed to be emission from a black hole. Displaying an equation on the screen, he said, “I would like this simple formula to be on my tombstone.”

This phenomenon could be explained when Euclidean time was replaced with imaginary time and while this met resistance at first, is now generally accepted. However, this discovery implies that radiation carries away energy, leading to the fact that the black hole will lose mass and shrink and will eventually evaporate. This strikes at the heart of physics. If information is lost, it would be incompatible with quantum mechanics. Therefore, Hawking now concludes that information is not lost, but it is not returned in a useful way.

“It is like burning an encyclopedia. Information is not lost, but it is very hard to read,” Hawking said. Because he lost a bet to Preskill about whether information was lost in a black hole, he gave him a baseball encyclopedia. “I should’ve given him the ashes,” said Hawking, eliciting laughs from the crowd.

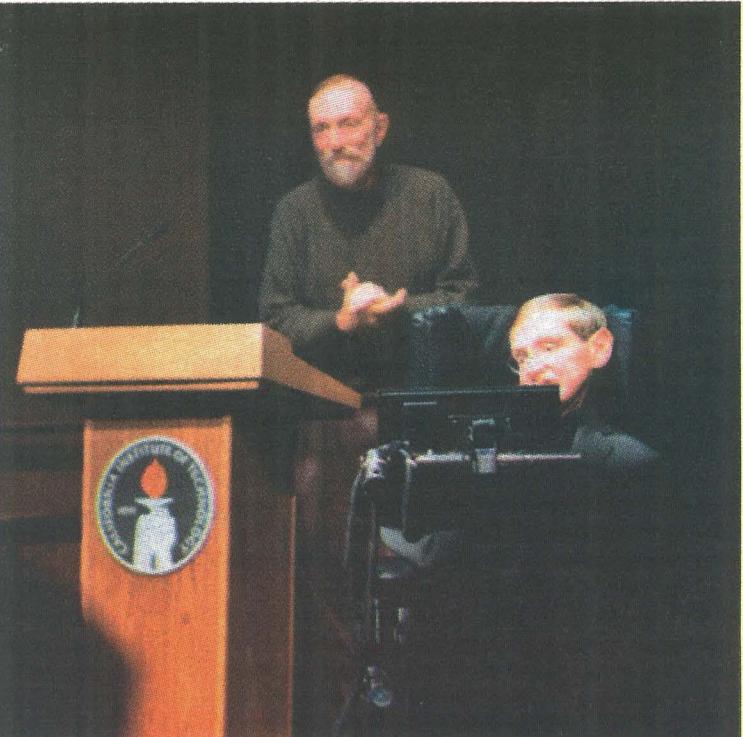
Hawking relates how he pictures the origin of the universe as the formation of steam bubbles in water. If the bubbles reach a critical size, it will expand and become inflationary, leading to universes such as the current one.

At the end of the lecture, with a picture of his guest appearance of the Simpsons on the screen, Hawking said, “I won’t compare it [research in theoretical physics over the last 40 years] to sex, but it lasts longer.” He was given a standing ovation.

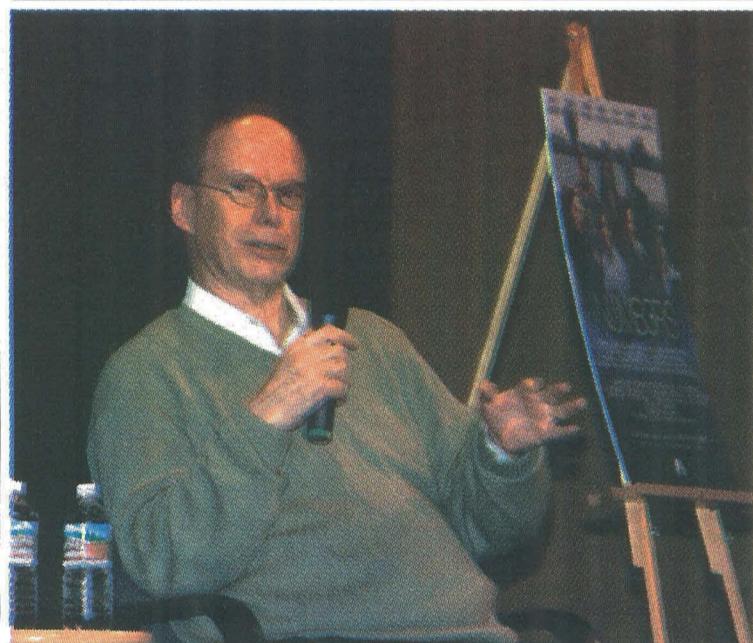
After the lecture, Thorne again stood up to introduce the student questions and add comments of his own. Hawking answered questions posed by Mr. X, senior Naman Bhat of Ricketts and Dabney Houses and junior Daniel O’Hanlon of Dabney.

“His responses are usually superb pearls of wisdom or superb off-the-wall jokes,” said Thorne. Furthermore, Thorne also said, “His answers are often like those from an ancient Greek oracle.”

At the end of the presentation, Thorne commented on Stephen’s dancing skills, as exhibited at President David Baltimore’s inaugural ball where he danced with various women. “Stephen knows how to have a good time. He follows in Einstein’s footsteps in more ways than one,” said Thorne.



K. Peng/The California Tech
Professor Thorne leads the applause after Hawking’s clever and entertaining lecture Friday evening.



D. Korta/The California Tech
Professor Gary Lorden answers questions about his role as math consultant to CBS for NUMB3RS.

Show Bases Math On Realistic Techniques

Continued from Page 1, Column 3

though it is largely implied. Charlie Eppes is a professor at a nameless yet distinguished college in Pasadena at which the celebrated physicist, Richard Feynman once taught. Some speculate that CBS wants to be one step removed from Caltech, just in case a conflict of interest between Caltech and the series ever developed.

However, a few segments of the episode were shot on campus anyway. One scene, for example, showed Charlie Eppes walking across Caltech’s lawn behind Millikan library and was met with wild cheers from the restless audience. Nevertheless, it is still a monumental

day in Caltech’s relationship to pop culture.

As for future episodes, it seems that they’ve already got quite a few ideas. Some involve using math to crack cases with an internet hacker, a computer virus, a structurally unsound building, cryptography, and a method of predicting bank robberies. While it’s too early to tell if this will be the hit show of the season, anything with this much math is guaranteed to be original. If you like math or you like criminal investigations, and aren’t too busy doing either of them, you should check out “NUMB3RS” when it airs next week.

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Record Rainfalls Result of Global Coincidences, Not Usual Suspects

By ZHIYUN GUAN

During the past two weeks, torrential rainfalls hit southern California after several years of drought. Within 15 days, a record 17 inches of rain had fallen in Los Angeles. The unusual and persistent storms were hard to miss, and generated much discussion around the rain-soaked campus.

While many people are curious as to the cause of this dramatic weather, Dr. Andrew Ingersoll offered his own take in an interview. The Anthony professor of planetary science, Dr. Ingersoll has a particular fascination for weather, especially on other planets, where relatively little is known. Weather closer to home, though, interests



Courtesy of gps.caltech.edu

Professor Andy Ingersoll

him as well, and the recent rains are no exception.

Although global weather patterns often take the blame for rain, Ingersoll's own speculation is surprising: the recent weather may have been caused by nothing more than chance. "Human beings like to think that there's a cause for everything," he observed, "but sometimes, there are no causes." Such, he believes, is the case with the rains of the past weeks.

This time, popular scapegoats such as El Nino and the jet stream have little to do with the local meteorological events. El Nino, a shift in the ocean temperature, can lead to a dramatic chain of events; warmer waters create more evaporation, and therefore more moisture in the air and more rainfall, according to Ingersoll. "Since the ocean is so massive, those changes persist for half a year or more," he said. However, there is no significant El Nino this year, making it an unlikely culprit for the rain.

Nor is the jet stream a sufficient explanation for the weather.

A shift in the jet stream is often pinpointed as a cause for weather events without its own origin being understood. "That's not really a cause," Ingersoll said. "That's just describing the phenomenon."

Other weather patterns can also have long-term consequences. Arctic oscillation around the North Pole, for instance, has a cycle of ten years or more during which the counterclockwise winds change in strength. "That seems to be connected to ocean temperatures as well," he said. "That can often cause a string of anomalous years."

Ultimately, there is no one factor that created this winter's weather. "I would say this was a giant coincidence," Ingersoll suggested. "Three storms just lined up and slammed in to us." The most likely cause was a combination of events and patterns in the atmosphere and ocean. "The atmosphere just spits storms at us at random," he concluded, "but then the ocean can govern the rate at which the atmosphere spits them, and where they wind up."

Ingersoll noted that the recent rains follow a five-year drought in California. Neither the relatively long drought nor the storms, however, are particularly unusual.

Over the course of many years, such irregularities are common. "If you look back in tree rings and other indicators, you get drought for a few years, and then you get rainy periods. That too can be luck," he said. The same holds true when one examines weather over a short duration of time.

Over a five-year period, for instance, "if half the time a given year is going to be a wet year, and half the time it's going to be a dry year, the probability of having five dry years in a row is not all that small," Ingersoll explained. However, the current drought may be too much for even weeks of continuous rainfall to undo. "In the sense of filling up the reservoirs," he said, "I think the drought has not ended." One of Southern California's main water sources is the Colorado River, he explained, and the drainage stations to the river are mainly in states where the rainfall has not been as heavy.

The duration of the drought is also a factor; after many dry years, "it really takes maybe two

wet years to fill up the reservoirs again," Ingersoll said. On the other hand, the average yearly amount of rainfall has already been surpassed, making for a wet year. "In that narrow sense, the drought is ended, but that doesn't mean our water supply is back to normal," he said.

Does the near future hold more rains? According to Ingersoll, rain and sun are equally likely. "The best guess is that the rest of this rainy season has just as much probability of being wet as of being dry," he conjectured. "The rain that we just had is not a good predictor of what we're going to have in the future." (Forecasts predict no rain for the next week.) Personally, Ingersoll enjoys the rain: "I like it just because I grew up in the East, where we had thunderstorms and snow and rain, and I just like a change in weather."

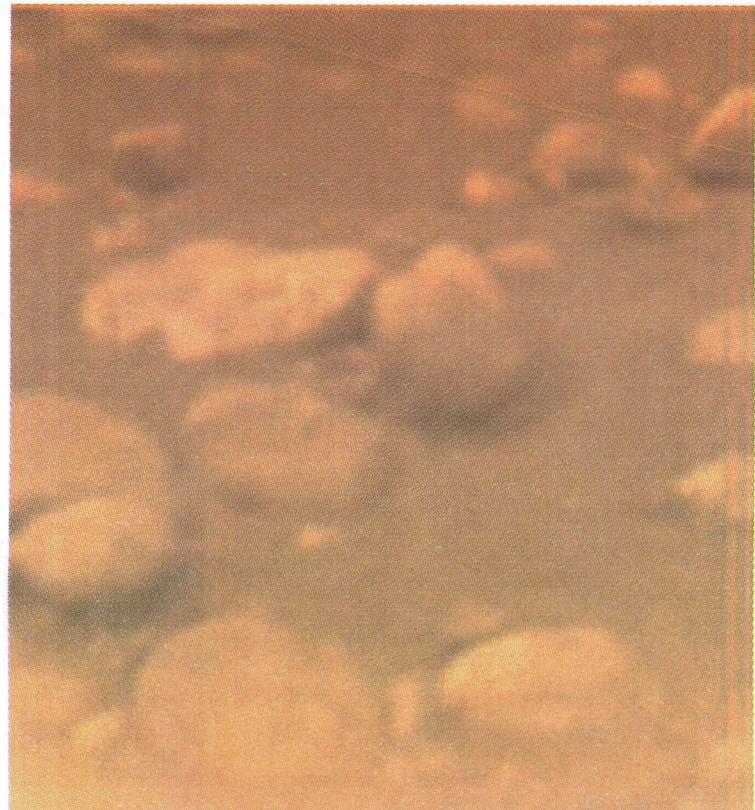
By SONIA TIKOO

Weeks after the holiday, scientists with the NASA Jet Propulsion Laboratory and the European Space Agency might as well celebrate Christmas in January. Released from the Cassini orbiter around Saturn on December 24th, the Huygens spacecraft successfully landed on the surface of Titan, the ringed planet's largest moon, on December 14.

Entering the moon's upper atmosphere at approximately 2:15 a.m. Pacific Time, the ESA-built Huygens craft engaged itself in a nearly two and one-half hour descent. During this period, an arsenal of scientific instruments and sensors were put into action, including Doppler wind experiments, mass spectrometer, gas chromatograph, aerosol collector, atmospheric structure monitoring devices, an aerosol collecting pyrolyser, as well as a descent imager capable of capturing an estimated 1,100 images of Titan's surface.

"Huygen's primary objective is to study Titan's atmosphere, and understand its winds, composition, chemistry, weather, etcetera," elaborated Robert T. Mitchell, JPL Cassini project director. "Titan is of great interest because it is the only moon in our solar system with an atmosphere, and at that an atmosphere quite similar to Earth's. So Titan may look a lot today like Earth did three or four billion years ago, so perhaps we can learn what Earth looked like then, how it evolved to what it is today, and perhaps we will even get clues as to how life started."

Mitchell continued, "Considering that my background is more in engineering than science, what



Courtesy of saturn.jpl.nasa.gov
The first color image of Saturn's moon Titan shows a reddish color on the surface.

Successful 'Landing' for Huygens Probe; Telemetry Bug Overcome

I most hope it reveals is that the design of the entry system was adequate, that it survives entry, and that the parachutes (three of them) all deploy properly, that the radio system works, and that it is a success from the engineering point of view. In terms of what we learn, I'm most anxious to see the pictures of the surface, and see what's really there. The scientists debate over whether it's liquid, squishy stuff, or solid ice or rock, and maybe all of the above in different places. The atmosphere makes the surface environment different than any other place in the solar system, so it can be quite a surprise."

According to preliminary telemetry analysis, following Huygens' descent and 90-minute transmission from the surface, Mitchell's hopes appear to have been confirmed. The European Space Agency has already begun the release of several compelling pictures to the public, including the first all-color photo. Titan's surface bears a slight reddish hue, and its level of darkness hints that it is composed of a mixture of water and hydrocarbon ice. Featured in other images are views of high and low terrain, along with possible drainage channels, indicating the possible presence of fluvial activity leading to what appears to be a shoreline according to ESA/JPL analysts.

Though Huygens seems to have met great success at this point, the road to this conclusion was not without flaw. One significant hurdle engineers were forced to overcome was an error made in the design of the receivers intended to receive Huygens' data. "The receivers would not be able to follow the frequencies they would be

receiving due to the Doppler shift caused by the rather rapid closure of Cassini to Huygens during the relay period. This error could not be fixed in flight because it was built into firmware that could not be reprogrammed." Mitchell explained. However, project engineers were successful in coming up with a solution. Mitchell continued, "The fix would have been trivial if we could have simply reprogrammed it like we can with the Cassini software. The principal part of the solution was to have Cassini pass by Titan and Huygens at a considerably greater distance than was planned originally so that the view to Huygens was one looking off to the side, instead of out in front, hence giving much lesser closing rates, and a reduced Doppler effect. The effect on the mission overall is really quite minimal."

Nevertheless, space scientists worldwide have observed excellence with the combined Cassini-Huygens mission. From observing the intricate details of the Saturn's rings to pondering fluvial activity on its principal moon, the over seven year wait since the October 1997 launch from Earth appears to have paid off. NASA currently does not have any other missions scheduled to the ringed planet in the near future, therefore, Cassini-Huygens is the key to revealing Saturn's enigmas to scientists, and indeed, to the world.

For more information about the Cassini-Huygens project or to track the progress of its scientific analyses, visit the European Space Agency's project site at www.esa.int/ or the NASA official site at <http://www.nasa.gov/> for the latest news and updates.

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