Lights, camera, CGI

A&M's visual science graduate program offers balance of art and scienc

STUART HUTSON
The Battalion

Who put the snap in Jar Jar Binks' tongue? Who tinkered with the toys in *Toy Story II*? Chances are, if there is a computer-animated effect on the silver screen, an Aggie had a role in putting it there.

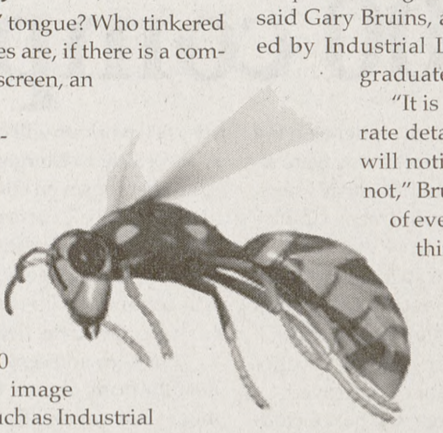
The reason behind the modern-day prevalence of Aggies among Hollywood's cast of computer generating characters is the success of the exclusive A&M visual sciences graduate program.

Accepting only 15 new applicants each year, the program has already delivered more than 80 high-level computer-generated image (CGI) professionals to companies such as Industrial Light and Magic and Disney since its inception in 1989.

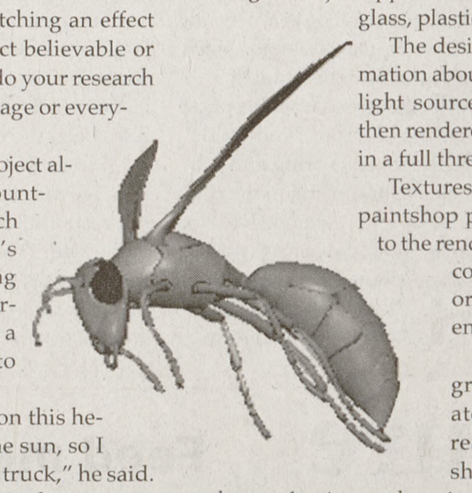
"The secret to this program's success lies in our emphasis on the basic knowledge of both art and physics," said Don House, professor of visual sciences. "While some schools focus mostly on art or mostly on science, our program allows students to have the knowledge to make things work right and the eye to make them look great, no matter what job they are handed."

A clear understanding of both art and the sciences is crucial to the creation of a realistic effect, whether it is a helicopter landing, an explosion or a wasp buzzing in the air, said Gary Bruins, a recent recipient of a fellowship funded by Industrial Light and Magic and a visual science graduate student.

"It is the collection of all the small and accurate details that no one just watching an effect will notice that makes that effect believable or not," Bruins said. "You have to do your research of every little aspect of the image or everything will fall apart."



Bruins said a CGI project always begins with countless hours of research on how an image's structure, functioning and overall appearance should exist in a computer format so that it is believable to an outside observer.



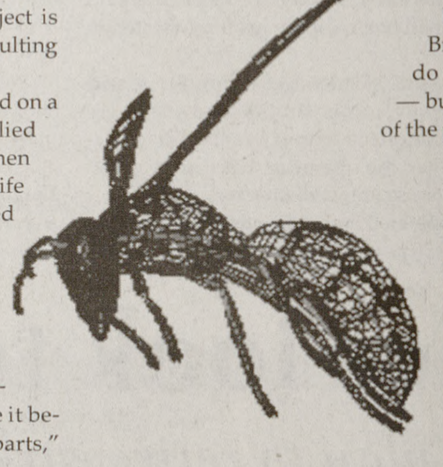
"I wanted to know how the red paint on this helicopter I was animating would look in the sun, so I went and took pictures of the paint on my truck," he said. "I wanted to know how it would fly, so I watched movies and studied at the library ... but at the same time, you have to know when to artistically fudge things so that the realism you are adding doesn't make the whole thing look odd or fake."

Bruins said the next step is to create a gray-scale model of the object (such as a wasp) that shows its form and function. Properties of the object's surface can then be assigned, making the object appear to have any consistency (such as glass, plastic, or cloth).

The designer then enters other information about the object, including where light sources are located. The object is then rendered by the computer, resulting in a full three-dimensional image.

Textures and colors are designed on a paintshop program and then applied to the rendered object, which is then composited with a real-life or computer-generated environment.

"We have programs that can recreate any picture of real life we want to show, but to put them together and animate them in such a way as to make it believable takes real knowledge of the world on our parts," Bruins said.



Bruins said that one minute of CGI footage may ta[ke] ... to a semester for a student artist to create.

"In the professional world, video clips don't ta[ke] long to make because everyone specializes in a step ... process. One person may model while another p[erson] takes that model and colors it. Then yet another p[erson] would take that ... composite it ... photograph ... by someone ...," Bruins said. "Her[e] ... do everything ours[elves] — but we learn every ... of the process."

The three wasps show the stages o[f] development of a CGI character cre[ated] by **Gary Bruins**: (bottom) wire fr[ame] beginning mode[l], (middle) render[ed] gray-scale mod[el] and (top) textu[red] and colored ima[ge].

Photo shows no Mars 'face'

STUART HUTSON
The Battalion

The Sphinx and the Martian landscape have nothing in common, according to a recent photograph taken by NASA's Mars Global Surveyor.

The spacecraft, which has been mapping the surface of the red planet for over two years, has rephotographed the Martian landscape heralded as the "face on Mars," revealing the face to be no more than an unusual arrangement of valleys and hills, said Don Carona, program director for the Texas A&M University Observatory.

Carona said that since the original photograph was taken by Viking 1 Orbiter in 1976, many groups have claimed that the face is comparable to that of the Sphinx and other ancient Egyptian sculptures.

"A lot of people tried to take the photo and tried to convince the world that aliens influenced the ancient Egyptian culture. They even went as far as cleaning up the blurry picture to make it more convincing," he said. "But it is kind of the same as saying that the mother ship is just on the other side of the comet — and the likelihood is about the same."

Carona said the original picture shows an optical illusion derived from odd lighting and the poor resolution of the orbiter's camera.

"There is an impression on the side of the mesa that when hit from just the right angle looks like a pair of eyes. Combine that with a peak underneath the impression that looks like a nose and the blurry photograph, and you have a face," he said. "It's nothing more than trick photography."

Entangled relationships

Physicists explore quantum phenomenon that seems to defy common sen[se]

PATRICE PAGES
The Battalion

In 1935, physicist Albert Einstein scoffed at an idea that seemed to deny common sense. Now, 65 years later, Texas A&M physicists are gearing up for an experiment that will hopefully yield new results on the concept physicists call "entanglement."

To understand the concept of entanglement, imagine a box containing two particles. Upon opening the box, the particles escape, each going its own way. But if you manipulate one of the particles, the second also reacts.

Though this action-at-a-distance property may not seem to make sense for the big objects of our everyday world, it is a property of the tiny particles of the atomic and subatomic size world.

Physicists discovered this strange property in the beginning of the 20th century when they started developing a new branch of physics — called quantum physics — to describe the properties of atoms.

In particular, in 1935, Einstein and two of his colleagues, Boris Podolsky and Nathan Rosen, wrote an article in Physics Review where they discussed the entanglement phenomenon which is now named after them — the EPR paradox.

Since the 1960s, many experiments have been set up to test this paradox, all using photons, or particles of light. They all provided results in agreement with quantum physics. However, detectors used in the experiments have an average detection efficiency of 25 percent — meaning results are based on only a small fraction of the photons actually used in the experiment because 75 percent of the photons can not be detected. As a result, all experiments to this point have been considered incomplete.

A&M professor of physics Edward Fry and his team are trying to solve this problem by using atoms, which can be more readily detected.

To produce an entangled state of two atoms, a molecule of mercury is split into two mercury atoms, which are further separated and detected.

"You start with a molecule made of two mercury atoms. Then you use a laser to break the bonding between them," said Thomas Walther, a team member and assistant physics professor. "Two more lasers are used to investigate the correlations between the two resulting atoms."

After four years of preparation and intensive testing, the Fry experiment should be operational in about one year. It has a detection efficiency of 99 percent, thus solving the efficiency loophole of photon-based experiments.

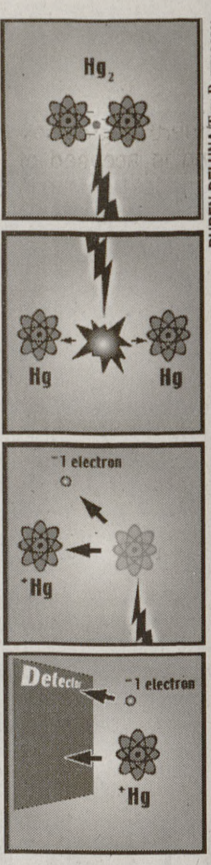
In recent years, the action-at-a-distance property of quantum physics has led to new developments such as quantum teleportation and quantum computation.

As described by physicist Anton Zeilinger in the April 2000 issue of Scientific American, quantum teleportation begins when a device scans a particle to extract information. This information is then transmitted to another device by means of quantum entanglement, which creates a copy of the original particle.

Teleportation of photons was first achieved in 1997 independently by physicists Zeilinger in Vienna and Francesco De Marini in Rome.

Quantum computing is another appealing application of quantum physics which can benefit from entanglement.

A quantum computer is based on bits, called "qubits" — quantum bits — that can exist simultaneously as 0 and 1. Such a computer can thus work on many input states at once, which would make this computer much faster than conventional ones.



RUBEN DELUNA/THE BATTALION

Step 1: A laser exci[tes] the two ato[ms] of a merc[ury] molecule

Step 2: A second la[ser] separates th[e] two excite[d] atoms

Step 3: A third lase[r] ionizes eac[h] atom so it c[an] be detecte[d]

Step 4: Each ion is [an]alyzed for i[ts] direction o[f] travel

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THE BATTALION (ISSN #1055-4726) is published dai[ly] ... through Friday during the fall and spring semesters a[nd] ... through Thursday during the summer session (except Univ[ersity hol]idays and exam periods) at Texas A&M University. P[eriodicals] Postage Paid at College Station, TX 77840. POSTMAST[ER: Send] address changes to *The Battalion*, Texas A&M University, 11[11] ... College Station, TX 77843-1111.

News: *The Battalion* news department is managed by stude[nts at Texas] A&M University in the Division of Student Media, a u[nit of the] Department of Journalism. News offices are in 014 Reed M[cDonald] Building. Newsroom phone: 845-3313; Fax: 845-26... Thebattalion@hotmail.com; Web site: http://battalion.tamu...

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