Tooth Sleuths

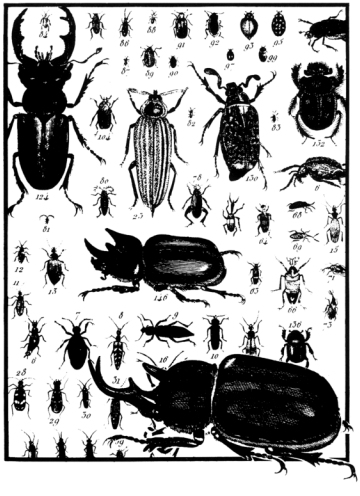
While police-employed psychics, and other questionable characters get the bulk of the press coverage, more and more of the real work of crime detection is being done by dentists. According to Dr. Howard S. Glazer, a consultant in forensic odontology to New York City's Chief Medical Examiner, forensic dentistry is becoming more important as the FBI gradually destroys its files of non-criminal fingerprints. Moreover, today's tooth sleuths are adding some bite to the law. Says Glazer, "bite evidence is court admissable, so we're going to see more and more dentists testifying."

Lawn Power

Scientists call them "anthroprogenic grasslands," and they occupy somewhere between 25 and 30 million acres of the United States, enough to cover the state of Massachusetts. The rest of us call them lawns, and we care for them, fret over them, and occasionally decorate them with pink flamingos, concrete Mexicans, and hedges pruned to look like chickens.

John Falk has spent the last 13 years studying these little seas of what the poet Walt Whitman called "the journeywork of the stars." An ecologist at the Smithsonian's Chesapeake Bay Center for Environmental Studies in Edgewater, Maryland, Falk spent one of those years examining his own 1,000 sq. ft. lawn. He collected and identified the insects on his lawn, counted and cataloged the birds, and weighed and analyzed all the grass clippings. He recorded everything that happened, even the time it took to move the water sprinkler. For the rest of his research, however, Falk ranged far afield, studying lawns around the world. Some of his findings:

- The average lawn contains 30-50 different kinds of grasses and weeds, as well as snails, spider mites, spiders, earthworms, and over 100 different species of insects. It supports some 20 to 40 times more birds than found in natural grasslands. The reason, says Falk: "Lawns are islands of food resources in a sea of concrete."
- The energy spent maintaining this average lawn is more than twice that required to grow a comparable crop of corn or tobacco, or to raise a vegetable garden.
- Many insects — leaf hoppers and frit flies ("frit" not "fruit" is correct) among them — prefer mowed to unmowed lawns.
- Our fondness for lawns may be deep-rooted in our distant past, particularly that time some three million years ago when our ancestors populated the grass savannas of East Africa. Falk tested this idea by showing photographs of different landscapes to people from various parts of the world. Asked their preference, the subjects overwhelmingly picked savannas, even though many had never seen such terrain before.



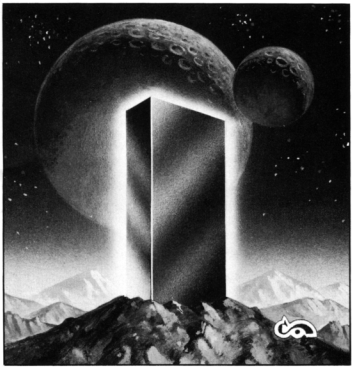
2010: One Mystery Solved

Stanley Kubrick's now classic film of Arthur C. Clarke's *2001: A Space Odyssey*, released in 1968, left moviegoers with a host of questions: Who or what transformed astronaut Dave Bowman into a Star-Child? Was HAL, easily the best known computer in all of literature or film, really insane? And perhaps the most puzzling question of all: What purpose lay behind the black monolith on the moon and its much larger brother orbiting Jupiter? At the close of Clarke's original novel, Bowman takes a space pod out to investigate the Jupiter monolith and utters his final, enigmatic statement — "My God, it's full of stars!"

Before long moviegoers will have answers to several of these questions. Clarke's sequel to 2001, *2010: Odyssey Two*, was published last year, and the film version, although now snarled in Hollywood politics, is sure to be forthcoming.

Clarke's sequel clears up the matter of the monoliths, among other things. In 2010, the Jupiter monolith descends to the surface and, after reproducing itself millions of times, turns Jupiter into the solar system's second star. "I know what they are! They're von Neumann machines!" cries one of Clarke's characters as he watches this incredible spectacle. "Suppose you had a very big engineering job to do ... like strip-mining the face of the moon," he explains. "You could build millions of machines to do it, but that might take centuries. If you were clever enough, you'd make just one machine — but with the ability to reproduce itself from the raw materials around it."

The von Neumann machine is the brainchild of mathematician John von



Neumann (1903-1957), generally regarded as the father of the computer. Von Neumann, in the 1930s, considered the then widely held notion that machines somehow follow a law of complexity — that the tasks performed by the machine must be less complex than the machine itself. In other words, any machine produced by another machine must be less complex than the original. Noticing that living systems — cells, cats, and humans among them — routinely produced new systems at least as complicated as themselves, von Neuman suspected that there was in fact no law of complexity. He then went on to demonstrate it mathematically, in his "General and Logical Theory of Automata", published in 1950.

Von Neuman not only showed that is was theoretically possible to build a machine that could reproduce itself, but also showed that it was possible to build a machine that will produce any other machine, no matter how complex. All it needs is raw materials and sufficiently detailed instructions. Moreover, such a machine need only have four parts — an assembler or "factory" that puts together raw materials according to instructions, a set of instructions, a duplicator to make copies of instructions, and a controller to feed instructions to the factory. Such a machine can not only reproduce itself, but can produce new machines of superior complexity. Decades after von Neumann's orginal work on self-reproducing machines it was shown that DNA, the stuff of life, is made up of four parts and works exactly as von Neumann described.

Fans of the original film will be pleased to know the sequel does not clear up all the mysteries. There are enough questions left open to warrant a third, perhaps even a fourth installment of the tale that begins in 2001. ▲

IN GAMING TERMS

By David Cook

The idea of a reproducing machine was a common one to science fiction even before von Neumann set out to study it. If a referee wishes to include these machines in a STAR FRONTIERS™ game, the following information covers possible situations.

History: The first known use of a von Neumann-type of machine in the Frontier came shortly after the entry of Human colonies into the area. Once the first Human bases were established, the now-overthrown government of Theseus sent 10 Independent Material Processing Plants (IMPPs) into space. Each IMPP was sent in a fully automatic starship with the following tasks to complete:

1. Locate a Human-habitable world currently not recorded.
2. Construct copies of an IMPP unit to computed maximum efficiency number.
3. Process raw mineral resources of a planet into usable form.
4. Process all IMPP units (but one) into usable form.
5. Proceed with cycle again.

The idea was that the IMPPs would be forerunners of Human expansion into the Frontier. When a colony ship arrived at a new planet there would be a good chance that large quantities of mineral ore would have been mined and refined before the Humans even landed. Unfortunately, there were problems.

The worst of these was the fact that the machines were instructed to only avoid planets they had not previously recorded. Through an immense error, the machines were not instructed to check for life forms before beginning work. This oversight resulted in the environmental destruction of several Human-habitable planets, the destruction of at least one intelligent primitive race, and a full-scale war between the machines and a Vrusk colony. Given the events that occurred, the IMPP project was abandoned and all known IMPPs were destroyed. However, not all the machines were found.

The other major use for von Neumann machines has been recently devised by the Sathar. Fragmentary messages from the edges of the Frontier and beyond have reported raids and attacks by Sathar and machines working together. The few facts available seem to indicate the machines are of the von Neumann type.

Referee's Information: The following gives the information the referee needs if he wants to have an encounter between the player characters and a von Neumann machine. The types of machines covered here are both the IMPP and the Sathar war machines.

IMPP (Independent Materials Processing Plant)

There are 3 main units to an IMPP. They are:

Starship

This unit is an unmanned spaceship capable of interstellar travel. It is the heart of the IMPP, containing the

level 6 main computer (the controller/duplicator), the memory banks, an assembler unit, 50 hunter units, 8 orbital shuttles, sensors, full maintenance services, the starship controls, and the drives. Upon detecting a suitable planet, the computer places the ship in a geosynchronous orbit above the equator, locates an easily accessible deposit of raw material, and sends the assembler unit to the surface. This unit then begins to build the next major unit of the IMPP, the plant.

The starship unit is 500 meters long and 100 meters in diameter. Although unmanned, it does have access passageways and hatches for Human maintenance crews. The inside of the ship is not pressurized, however.

The Plant

This unit begins its work once it is assembled on the surface of a planet. The plant unit has three functions — to create a pre-determined number of copies of itself, to produce hunter units, and to then become a processing center. The plant is a semi-mobile operation controlled by its own level 6 computer. Composed of modules, each module has a set of tracks that allow it to move cross-country very slowly. Once the original plant has created a second, the second moves to a new location and begins to build another plant. The number of plants grows like a spreading wave from the original. After a set number of plants have been built in an area, hunters (the third unit) are produced. Each plant will produce 1000 hunters. These hunters will be under the control of that plant, which is in turn under the direction of the main controller. After the hunters are produced, the plant begins to process raw materials, generally in the form of bars or sheets. These are sealed in a urethane coating to prevent oxidation.

A plant looks like a collection of huge tank-like vehicles, interconnected by huge pipes, conveyers, wiring, etc. The area is almost always desolate-looking, with slag heaps, waste, soot, and smoke surrounding the plant.

The Hunter

Top Speed/Cruise Speed: 60 kph/30 kph
Passengers: None
Cargo Limit: 20,000 kg, 40 cubic meters
Mission: Variable
IM: -3
To Hit: 40%

The third major unit of the IMPP is the hunter. This is a small (6 meters by 4 meters), mobile unit that serves as the legs and hands of the entire operation. The hunter's task is to gather the raw materials, carry them to the plant, and move the processed materials to a storage location.

The hunter resembles a cross between a dump truck and a backhoe with three extra mechanical arms attached. One arm is fitted with a clamp hand and is capable of lifting 1000 kilograms. Any character clamped by this hand will suffer 5-50 points of damage each turn. The second arm is an articulated hard rock drill used for mining. This drill will do 10-100 points of damage to any character it hits. The third arm is a sample probe, used to take mineral samples and perform preliminary analysis on them. If a character is struck by the probe, he will only take 1-10 points of damage. However, the probe will inject several chemicals, doing S20/T3 unless neutralized by an injection of an antidote.

Each hunter is run by a built-in level 3 computer. The mission of the hunter is usually to gather raw materials (ore) and carry finished materials to the storage area. A hunter will almost never bother living creatures. However, a hunter will be attracted to large deposits of metal such as a spaceship or a vehicle. If these are in the area, the hunter will attempt to dismantle them and carry the parts to the plant.

Sathar Ravagers

Very little is known about these machines and there are still serious questions to be answered concerning their true purpose, construction and use. It is considered unlikely that the Sathar would create reproducing war machines without some type of control over their numbers and activities. So far, only one type of machine has been positively identified. However, reliable reports of automated factories have supplied enough information to positively identify these machines as being of the von Neumann type.

Skimmer Ravager

Top Speed/Cruise Speed: 200 kph/150 kph
Passengers: None
Cargo Limit: Not carried
Mission: Unknown
Weapons: Turret-mounted heavy laser
To Hit: 60%
Damage: 8-80 points
Defenses: Albedo covering

The Skimmer Ravager is a hovercraft vehicle approximately 2.5 meters long, 2 meters wide, and 1.5 meters high. The entire outside of the vehicle is covered with albedo armor, giving it protection from laser fire equal to an albedo suit. The turret located on the top center of the vehicle gives the laser a 360 degree field of fire. The laser always seems to fire at the same power setting (8). The machine has never shown any inclination to conserve ammunition.

The machine is equipped with full sonar/radar/infrared/visible light/radio scanning. Each machine is connected to a main battle computer located some distance away, but is also capable of independent action if this link is jammed. However, when on independent, the machines are handicapped as they cannot work together as a unit; each machine can only do what it is programmed to think best at the moment.

Although the exact nature of the programming is not known, experience has proven the machines are instantaneously hostile to most lifeforms, including all character races. A