

BACKTOBIRTH



6 WAYS TO RETURN TO THE WOMB SHOW TO BOOST PRENATAL IQ SMACHINE DREAMS: PRIVATE THOUGHTS OF ROBOTS S MIND AND MARIJUANA MAKING MOVIES UNDERWATER

\$3.50



ONU AUGUST 1989

EXTOR IN CHIEF & DESIGN DIRECTOR: BOB GUCCIONE PRESIDENT KATHY KEETON EDITOR PATHOE ADDROFT GRAPHICE SIDECTOR TRANK DEVINO MANAGING EDITOR STEVE FOR ATT DIRECTOR DIMININE LINCHLINI

CONTENTS			74
FIRST WORD	Third World Children	Lawrence E Brace	
OWNERS	Data Bank		
COMMUNICATIONS	Consepondence		
FORUM	Superconductivity Results	Keen McKenney	
SPACE	Soho Cyborgs	Jeff Goldberg	
ARTS	Frim The Abyes	Alan Maurer	
FOREIGN TRACE	Science in the USSR	Jornser Gebert	
MINO	The Chemistry of Roofer Madriess	Leuh Wallach	
SIARS	The Hubble Space Telescope	Recerdo Giáceoni	
EARTH	Gactus Rustless	Jonah Houston	
BOOV	Drugs from the Sea	Mary S. Gluckernan and Eleanor Smith	
CONTINUUM	Ecology Wirs ato		
PRESCHOOL?	Life Bickers He/th The Psychology and Neurology of the Unborn	Perneta Went sub	
THE ROOTS OF PERSONALITY	Questonnare		
WOVE WITH A VEW	Six Exercises to Recapture the Expension of Birth	Kaid's History	
READING THE SILKS	Fiction	Michael Britisp	
DOWN AND OUT FEATHERED VICTIVS IN LIVING COLOR	Pictorali Avan Plunage	Stan Sinberg	
MAGWA FORCE	Scientists and the Mystery of Volcanoes	Debre Ryll	1
KINDLED SPIRIT	Leva Sculpture	Debra Ryll	Ū
INTERVIEW	Rebotical Hass Moravec	Ed Regis	
ANTIMALTER	Wisconsin UFOs etc		ī
STAR TECH	Mascal Gloves Pain-See Telephones, and Other Tools for the Twenty-Pinst Century	Judy Feldman	1



Before Birth This Feeth Moeth dispects as of furnish experience. We made the world, Carol G was the World by and Jim Horse the wind or for this month's cover which was also a posser i pharmachistical company 2 OAAs

NCK NY II



FIRST

By Lawrence E. Bruce

◆Every day, 40,000 young children in developing countries perish from mainutrition and preventable diseases. One in every tirree deaths in the world is that of a childrender five years old. ♥

have you wor seen as diffel day? Every single asign 40000 mothers in developing countines stand by repleasity as their criticises persist here marked and easily preventable diseases. Baddelly cone in very thorp diseases in the world is that or a chief developed the world and of the years and introducing organization for the world introducing organization principles. See the properties would consider the properties would consider the properties would consider the properties would provide the deaths of the properties would provide the deaths of

minical-log cogn (hereginsts genehing) we even history objects (hereginst genehing) we even history of entires. The probleming et also probeding to explain object to expression in last the increacept objects again, values are a proper to aid that stacked the prolical probleming of the prolical probleming of the prolical probleming objects and propage verifical refers (but only objects) as page verifical refers (but of the propage objects and propage objects of the propage of the protack of the pro

before ther first birthday Tokay that Tokay that Tokay has displaced to 19 retion. An impressive improvement, but the number of children during from preventable papers is self-too high. The death of eyen.

Detayropon van die meissen nieder per pre-tearno ausse of chiff nordright Chief of the contrast invoces that Causes, tempere from constructed contrast, and the contrast of the contrast deals (Cabette) in mercent eventual cases of the contrast of the contrast reposited make it and it in Distriction system. I be to good of an extraption for distriction with an acute intention interests. Table dispussions the body and facilities of the contrast contrast of the contrast and the contrast of the contrast and the contrast properties of the contrast and the contrast cont

Is green with the out-of-orthological state of the control of the

were treated with OPT: today 25 percent

33 milision districts under age fine de auch year from privare statel describe Such as massive, without privare cough privis dipfleriest and full-bersules is. They shidden could be saveted they variety were given the years years of the privare and they are valued to the privare partiest of the privare and person of years of the second person of years of the challenge of the privare and person of years of the challenge of religious leaders, comments of the privare they are the person of the person of the person person of years of the person of years of

In the Daminican Hequilities Audust Intarial Sylumeness on boxes is house to includent children. In Seminar hardfareat warpfeless bed of the transplane of the arrised of term unusuon learns. And in Charlies and proper with state powered deling critical devices carry significant or devices significant or devices carry for property or power or device.

milion to tewer find 250,000 immer Associations however, cannot save at orthe philipen who ble, A vacche canti potect against manufathor, responsible to rote their on ordinate and detital worldwide. Surprisingly, the cause is no constant, a short-graphy to cause is not one of the constant and their analysis of the constant in the country of their ordinates.

to children in actions. The unswers

and tompresses — a life was as in the more than the contract of the figures are consucered. The figure is the area with a follower are sufficient to the present and the contract worked. The size of the worked worked worked and the contract worked worked and the contract worked and the contract worked and the contract to the contract worked and the contract worked and the contract worked and the contract worked worked and the contract worked and the contract

disease a broken.00

CONTRIBUTORS











says Weintraub, the mother of two young boys, Jason and Devid, "I was particularly annous during my first pregnancy, and one time I even felt Jason moving around in a frenetic kind of way. I was much calling during my pregnancy with

around in a frenetic kind of way I was much calmer during my pregnancy with David, however, and he's a calmer child than Jason." Was your personality six in the womb?

Wes your pessorally set in the words? In find out, messgale your own prepared and set the opportunition in the precusationnarie developed by forente psychranist Thomas Verny, Verny will analyze the result of this survey, the largest ever conducted by pre- and permitted psychrologists, and report on the findings in a future state. And psychrologist RMT Ferny has created page 30 that should help you recipies dedise about your crey risk the world.

We don't known! Maurice Nrafilits seeming obtesions with inclainates demission in the promised september. Witching the mind so demission in promised september of the Working and the mind september. Witching and the working a layer flow in a literature appaule Knaffler mission will be as tracerdous as at sounds. The temperature and the september of the september

nature. But they also get as close as possible to erupting volcanose. They're an enthusseltc—and intepid—group, says Ryil, an associate editor of the California publication New Times. For the most part, she adds, "these goo boys are kids who grew up to do what they always wanted in do."

If Harin Museuc were to achieve his traiting, hid become a ribbot—one of his own design that would have the godfile ability to do and opportuno or guide ability to do and opportuno or guide senous about his thoony of downloading, a process of transferring a present smed into a fast, powerful computer And in this mortifit is flexivow computer and in this mortifit is flexivow computer and in this mortifit is flexivow comb beam's control into Orani Witer & Geges gode Morrace, director of Camegue-Mallon University's Music Rock Localities of the bursen brain bersteles to be bursen brain bersteles.

from its bodily prison.
In this morth's fiction, Nebule-ewardwining author Michael Bishop spins
a take about a seer who reads the future
in butlerity wings ("Reading the Siles,"
page 48). The paperhask edition of
Bishoph in over the Secret Ascension—
PRINE A Dol. & Deart, Alse was
published recently by Tor.
And obtionspoker Erans Lantino.

examines the plumage of other arborne creatures in "Down and Out, Feathered Victims in Living Color," beginning on page 58. It's a very plucky pictorial DO

sked during a radio interview how he first became interested in music, Canadian conductor Boris Brott hesitated for a moment and then responded, "It may sound strange, but music has been a part of me since before birth." As a young man Brott was mystried by his ability to play certain pieces sight unseen Conducting a score for the first time, bewould instantly pick up on the celios notes and know the flow of the music that followed it turned out, however, that the scores were not unfamiliar to him. His mother, a professional cellst, had played them white she was pregnant.

in anection either was begregint in in anection either anection people have reported memors, personality qurks, and even aphtudes they say they acquired before birth—not through genetics but will a eithernal sounds, wholones, and even feelings in "Preschool?" (page 34) sound either all will be (page 34) sound either will be eithernal follows scientists who are sturking the previousness and no purchase.

(page 34) senior editor Pamela Wenthaub foliows scientists who are studying the naurological and psychological fife of the unborn. They soothe, stimulate, and even communicate with folioses. Some researchers claim they can teach the februs music and language. The new and controversial field of

prenstal psychology, Weintraub opines, can certainly make the birth experience more positive for birth mother and child. The convinced that there is a definite relationship between the experiences and attributes of the pregnant mother and those of the unborn child," 8. 0MM.



808 GUCCIONE editor in pitrel & publisher KATHY KEFTON

CONTROL PUBLICATIONS INTERNATIONAL LT

THE COMPORATION

Bab Gussione (charmen of the board)
Kathy Kester (vince charmen)
David J Myerson (president)
John C Pretich (kesinative v.p., optration

And Could Myseum (procedure)
And Could Myseum

Carree, Father South Merris Chicanal Execution Book Disulsable Badderfor Clerker, Accessing the Chicanal Chemican, Fatherf Menigens, Contribution Children Chemican, Fatherf Menigens, Contribution Children September (Pilot and German), Member (Inc., 1971), 2018. September (Pilot and German), Member (Inc., 1971), 2018. September (Pilot and German), 2019. Member (Inc., 1971), 2019. Memb

ACCOUNTS ON MANNEY THE WAY THE

GCD. Dead of Medical or Wil-American GCD. Dead of Medical or Wil-American Deador Services and Medical or Wil-American Deador Jen Evras Sr VP/Dead Francisco Cheek Jenn Pedical Countyle Services (New Magazine Good Paris Corrin, Se East Ang See Chair American, De Medical Services Services (Deador Medical Corrin), Se Francisco Medical Composition (Services of Medical Conference on Composition (Services of Medical Conference on Composition (Services of Medical Conference on Composition (Services on Composition (S

LETTERS

COMMUNIC/ATIONS

Mistaken Identity

Thank you for your outstanding May issue. I commend you for your article on Maharishi International University I'l evitation I.I. 'May 1989'). The fact that page billing confirms your willingness to address the advancement of individual and collective consciousness. One point that deserves mentioning. As ac often happens, the sensational aspects of MILI's programs (such as levitation) were discussed at length, but the substantial scientific research taking place (recent studies on reductions of war deaths during group meditations) was mentioned only in passing and rehitted by experts offering no backup to support their opinions

Patrick D. Bosold Fairfield, IA

Your article on Materials International University pass of the impression field MIU faculty of all the research on the MIU faculty of all the research on the Terraceachersh Meditation and TM Sidth program and that the rest of the seadomic world is skeptical about it. The fact is that over 460 studies on TIM have been conducted in 160 independent research institutions and universides of the research institutions and universides of the research institutions and universides of the research has been conducted by MIU or affision universities.

Chairman Department of Psychology Maharishi International University Fairfield IA

Dunn Again Just wanted to drop a letter in support.

of J. R. Dunn's "The Gates of Babe!"
[May 1989]. I found the story capfivating
and innovalive, a superb job. I'm looking
forward to more of Dunn's work and
more of the same science fiction in Crani
Harold Jordan.
Sarasofa, FL.

Needled Injector Michele Kort's article "Needlekss Injection" (Continuum, May 1969) leads

one to believe that Dr. Benjamin Flutin and John helpine in Unwindly are heeded down a path that no man has ever trewide before. The facts, the Derata Corporation currently has \$2,000 exited to support the control of the properties of the University of Minnocota Pediatric Conclody, Orline has used our importor for the needle flees administration of analytic flee in America of childrens, thus of impating his payment of the University of Minnocota Pediatric flee in the University of the Universi

Tom Maloney Director of Engineering Derata Corporation Minneapois

What Fools These Mortals Be

I read the article "Reeducating America" Forum May 1989) with a great deal of interest. Psychologist Bohert Ornstein's concepts of "knee-jerk" reactions to everything that occurs are fasquating. though few of us get the appartunity. to rid ourselves of these enslaving ideas. Last the feeling Ornstein is frying. to tell us that each of us, no matter what his mental or artistic capability has a responsibility to himself and society. and that the educational bureaucracy should emphasize that fact. Thank heavens there are always a few who risk being unpopular to tell the rest of us what tools we are

Roger Burson Marshall, VA

Whale of a Metake

In the Jaine Inferrover with University of Heweir psychrologic Louis Horman, It was reported that Horman and his colleagues published a caraling of 12,000 whales they have managed to identify in Hawaii and elsewhere. The correct rundher is 1,200. Also, the name of the Indiana University psychology professor who conducted motody recognition openments with drophers at Horman's laboratory is. Jim Ralston. We regret they errors QO.

MASTERS OF INVENTION

FORUM

By Kevin McKinney

icture this: Mobile transporters called superleves carry fountains, gardens, and sidewalks nost the fifty-fourth floor of a twenty-first-century skyscraper: floating hillhoands entice you with images of the latest fashions, and elevated "niatiorm cities" provide an alternative to Iving on congested city blocks Kenneth Schulze of Bocky Biver, Ohio. submitted this futuristic urban vision

in our Superconstruction contest In the November 1987 issue writer Bruce Schechter gave readers instructions on how to make a superconductor. Ordinary electrical conductors ha pointed out, exact a stiff toil on the electrical current they carry, releasing a significant amount of energy in the form of heat. But superconductors lose no heat at all. Moreover, when cooled to an extremely low temperature (at which noint they kee all resistance to electricity). and placed on top of a magnet, superconductors display a curious characteristic. With both repelling and attracting properties, they finet unward and remain

We challenged readers to submit their ideas, in 200 words or less, for the most creative uses for superconductors. Your superconductor applications, we said, could have worldwide significance or could simply be fun. The grand prize \$500. Schechter and science teacher David Pribyl, who has taught his Gilroy, California, high-school students to make superconductors, helped us narrow down the hundreds of entres. Our final decision, a result of much discussion and careful review of the entries, is based on originality and feasibility.

Many ideas focused on computer space, military, and medical applications In the area of medicine, for example, Chicago's Rebecca Saxe thought "floatrest" bed linens and "magna-rest" mattresses would prevent bedsores and provide more comfortable sleep Pennsylvania dentist Harvey Goldbern suggested using superconductors to retain dentures. A superconductor

implanted in the inwhose would eliminate the need for adhesives.

Other readers offered ideas in the entertainment field. The the superconducting girball machine devised by Jim. Weatherby of Portland, Oregon, Phil Ryan of Bow, New Hampshire, suggested the use of superconductors in backey nunks and Astro Turt Maria McPhalinu of East Syracuse, New York, added hobsloris to that list. Rollor coasters and bumper cars with superconductors

were also widely espoused Silvia Morales of Central, South Carolina, called for a "scientific phenomenon-turned-frivolity" in the form of a superconductive hallroom in which "ladies in lace gowns and men in starched slacks, wearing shoes with superconductor soles, alide smoothly

across the magnetic floor Teachers at Frank W. Cox High School in Virginia Beach, Virginia, and Prince Andrew High School in Dartmouth. Nova Scotia, Canada, assigned the superconductor contest to their classes. In fact, when we were closing in on a

winner one student from each of these schools was still in the running According to Cox's Billy Vest, the increased magnetic fields of superconducting electromagnets could be ers. Other entrants supposted similar

harnessed and used as shock shoots. automotive aids, but Vest weet into great detail about the shocks' operation On Veet's shocks aix magnets would

he aligned inside a normalal tube to hold them in place so that they would move up and down rather than side to side. Another magnet would be attached to the body of the car and one more to the wheel. When the car hit a burno. the electromagnets would be pushed together while the repelling force pushed them arrest: "In this way," Vest wrote "the wheel and the body of the car will be pushed equally apart." This earned him a runner-up prize of \$50

Our \$500 prize, however, goes to Prince Andrew's Jeff Simlett, who believes that the benefits of superconductors in the artistic arena have been overlocked. David Pribyl, for one, agrees: "The application of superconductivity in the art world is an extremely original.

fresh, and teasible idea. One of Similett's suggestions is the

placement of sculpture on supercon ductor platforms, floating above the floor and rotating so that works of art can be viewed from all sides. "The artist's into would be much easier too because the stone could be easily turned white working on it." Simlett wrote The high-school student tocused on

the performing arts as well. Even the theater, he added, could make use of superconductors. "The eene entrance of phosts and phantoms, for example would be much more effective if the actors actually finaled rather than walked or glided on wires," he pointed out-Superconductors could also lead to more complex set designs that could be quickly changed between scenes. Although Simlett has been singled

unit placed in the dentures and a magnet. Superconductors' imagining the possibilities

out as our champion, all the contest entrants are winners. We congratulate everyone for their effort and creativity DO

DESPERATELY SEEKING CYBORG

SPACE

By Jeff Goldberg

n Now York City, when you say Haveton you are talking the street that separates Greenwich Village from all that is south of Houston: Soho, Little Italy, the Lower East Side. You are thinking Late-Night Voguing with the Club Scone I thra-Chic-Trendy-All-Black Clothes, Eurotrash, Postmodern Art and Galleries, and Upscale Eateries. You are not talking Houston. Texas. And you definitely are not thinking aerospace. Yet if you follow the consernor smell in the air below Houston to a popular mulfin bakery on Flizabeth Street, then dimb the dilapidated stairs to the loft above, you will find a thriving corner of the space business. Honeybee Robotics This tiny eight-person firm, located in an old brick building with a loading dock out front, recently won a hefty piece of a multimillion-dollar NASA contract to work with Martin Marietta and Ford Aerospage in creating the Flight Teletobotic Servicer (FTS), an ultrasophisticated robot that will help astronauts build and maintain the 500-foot infra-

structure of the space station Freedom

*Pannia hira us hangues we miy creativity with an ability to deliver markings that work " says Honovhee's thirty-four-year-old president. Stephen Goregan, who once made his living writing ad ingles for late-night TV. The company's other personnel are no less unusual. Vice-President Christopher Chaoman, thirty-eight, was a music therapist at St. Vincent's Hospital in Manhattan Chief engineer Chuck Hipherman, thirty-three, used to make ntrinate electronic kinetic scuintures And provialled designer BII Record forty-three, once led African safaris. But all except financier Chapman do have engineering degrees

Now the saint lies burned away from youthild callinaces to focus its creativity on designing the FTS's end effectors (is hands), the tools it will use and the foot that will attach the robot to its workstation. Hencybee is already building a man-size model of the FTS hand in one corner of its write-welled list, shop, which is filled with robotic clutter and Art Does forms and diswing boards.

Astronauts will use the working model to train on the ground. The FTS, a spiritual heir to C-3PO, is almost humanoid in appearance—with a head, two video-camera eyes, a chest from which extends an assortment of different hands, and two the-hoot foun, another arms.

During the research phase of its project, the toam experimented with "borne pretty strange alternatives." Hoberman recalls in the end, though, they opted for the current modal, the says, "because FTS will be opporated remotely by an estionars, at a control station, so we didn't want something too different from the human form."

Like its creators at Honeyhee, the finished what will be multipleated while to remove one hand from its wrist place it in an appropriate holder in its chest, and attach another hand to perform a new function. The FTS will be able to perform a range of tasks wider then that of any other robot now in existence. It may handle complex oneof a kind jobs under human supervision: deploying the Freedom's radiator panels; servicing satellites and mating electrical connectors. Even more impressive. FTS will be able to join the metal truss connectors that make up the backbone of the space station

The advances in robotics embodied in the FTS—so essential for the successful construction of the Freedom-studied also fine deviating approximate. When the space station advances were successful constructions of the freedom-pressure form Congress to use technologies with practical sprontist," says Corevan. Then after the Chaltengar explicited, there may have been a mittain inclination and the site than the first of stationary control of the properties of stationary manifest of stationary manifest of stationary manifest of the first the first site of stationary manifest of the first the first site of stationary manifest of the first the first site of stationary manifest of the first site of stationary manifest site of the properties of the stationary manifest site of the stationary manifest site.

Before coming onboard the space station project. Honeybee (named, Gorevan says, after "the greatest structural engineer in nature") specialized in industrial robotic systems that displayed an astonishing degree of hand-eye, or rather effector video-commup DNAME M.



Making the space scene: New Yorkers give NASA's robot a hand. 12. OMNI

DEEP-SEA CINEMA

ARTS

By Alan Maurer

long a deserted back road itside Gaffney South Carrière the shandoned Cherokee Nuclear Power Station looms amid a sand plain, the concrete walls of the station's vacant tanks overshadowing the scrub. It's an unlikely site to film an underwater movie, but for five months last year the director of The Terminator and Aliens took over the area to shoot his latest film. The Ahvas. The result of course demonstrates a use for a defunct nuclear power plant. But the film production also pushed today's diving equipment technology into the movie's near-future setting.

movies ender-future setting.
An American nuclear submarine,
mysteriously disabled 2,000 feet beneath
the Caribbean, sets the course for the
plot and subplots of The Abysis The
US Navy drafts the oil ing diverse aboard
Deepoora, a prototype hyperbaric oil
drifting habitat, to assist SEAL (see, ar,
and land) commandos in the sub's
rescue, American gihar developments, the
SEAL leader experiences high-pressure
nervious syndrome, a rate underwater

mailed that causes him to suffer paramid deutions and to endanger overyone below and above the water. Director James Common and to the paramid to the paramid to the tim in the open sea because doing so, Cammon says, "acould have posed too many pebblered," the anthoring was the paramid too many pebblered, and the substifly thinks, and "teaching that to act." They were looking for a more controllable size, and thermaker Earl Owenstby provided the perfect boadion. Cherokee anywhere: "Hud says.

Cherokee investment "Hard stage.

Owenshy Firm Studies purchased the
Cherokee property for "several million
class" in 1986 and turned the sile
into a film production facility. Owenshy is
sys. Stoor then, moves like University
to show the stoor of the Arbysis,
nowwerk was the siles that undervisate
nowwerk was the siles that undervisate
to show the stoor of the stoor of the
stoor of the stoor of the stoor
stoor of the stoor of the stoor
stoor of the stoor of the stoor
stoor of the stoor
stoor of the stoor
sto

filming," Owensby says. "But Jim Cameron wanted to use the larger, containment tank, too." Pilling the 55foot-deep containment tank with 75 million gallons of water, Owensby adds, turned Cherokee into "the largest underwater tim facility in the world."

With Academy March continues and winners for an design and special effects—welerane of such science-fiction and fantase flicks as 52th Wars and flauders of the Lost An—the technical staff was well versed in move magic But Camston and Fund didn't ward flusions. They insisted on reation: Everything hadness, backpacks, underwater verselales, and habitals—had of function, wheeless, and habitals—had of function.

Carmeron warried to use Deep Potent, and advanced subtransible with a 360° Pleuspias were port and the ability to the bit 2000° Bleuspias were port and the ability to the bit 2000° Bleuspias were professionally as the subtransible professional professi

up a quarter from the ocean floor. There is already interest—from charge at the Seattle Aquasium, for ore—in the driving thermits VSM diveleged for The Asys. The standard underwater handhal folds files enriching in alternatus would wear, but it has a fine-pixel like a sits suche mask, which blocke possible end wison. Moreover, it prevents a clear view of the duver's face, which rendered the mask unwastile for Cameron's surposes.

The prototype Abyss helmet was credited by WSM vice president Bob Kirley, who was also responsible for the helmet most commercial divers use, the Super Line 7 The Abyss model has an advanced breating regulator and an arcraft quality communications system. Its isospiate extends from temple continues on years or prototype or pro



Life's Abyss and then you dive. Reality imitates the movies

14 OMN

OMNI'S GLASNOST

FOREIGN TRADE

By Jennifer Gilbert

in the late Seventies the Arbat, Moscow's pedestrian mail. was dilapidated, the ice cream vendors being the only signs of life. The vendors were numerous, but the flavors were notthe only choice was vanilla. Today the Arhat has undernone urban renewal. gentrified to the point of gas lamps linion the street. The sounds differ, too. On a balmy day last December a Divisiand azz band cranked out "When the Saints Go Marching In" for an appreciative audience. In fact, Americans in Moscow are becoming increasingly numerous Encouraged by Gorbachev's gnerness, dozens of foreign businesses are cultivating relations between the two nations. The number of joint wentures with the Sowers has increased from none in 1986 to 365 in 1989 and has run the gamus from cancer research to pizza dalivery to the establishment of factories. In the spirit of glasnost, this September Orani will begin distributing copies in the Soviet Union

Orns will exchange 20,000 copies of the magazine cach morth, for one year, with the Soviet publication Science year. With the Soviet publication Science will be seen to the USSP published by the Soviet Academic Soviet and the Soviet Soviet

the magazine through a Bacingtons. The hat Sover Christ will include in Russian and moderal delicity the same in Russian and moderal delicity the same has expensive superplaced, the treasure hunt requires Sover readers to search for visual close throughout the magazine. These correctly identifying a limit of the processing of the same control of the processing of a router of prizes. First prize information, see page 95 (Because consume production and in the first distance of the prizes o

OMNI

excitement for the magazine and for its products," says Linda Newman, associate publisher of Ornic In addition to the sweepstakes, the September save will contrial a questionmate for Soviet readers, asking readers their opinions of Corni, and for information about themselves. There will be follow-up questionnairies as well, dissigned to gauge reader response to Orniv. One of

the goals is to give people from both countries a charge of people is one of An exchange of people is one of sometimes and people is one of sometime with the coming gear the magazines will trace an art director and an editor in an attempt to learn more about publishing in their respective. Some people is the people is a people is a people in the people is out of the people is now the people is now the people is the countries. If we will received internation, not only between magazine in the United State and the Sowie to the out also between the people Union, but also between the people to the people is the peo

exchange," says Keeton, who describes

Omni as a "window to the West" to which the Soviets have never had access She's opimistic that "they'il receive it with open arms, there is nothing like it in the Soviet Union." Travelling to Miscow in September.

iffavering to hospical in september, the Keeter will mere with members and the beauting of Scoreses and their parts of the september of the septembers of the septembers of during her weeking stay inciding a press conference on Miscow will prove a challenge, given that the Soviet communications technology available to the public parks in comparation with that of the West Phono lines are limited, and bills have been known to arrive the years after the weet.

Orani hopes for great success in the LISSE Cornes of all American managines are highly valued. For example, when sewing, women copy the styles of clothing found in the ads to give their families the latest fashions. American visitors to the Soviet Union are harraned with questions about the United States and Omni will be a tool to answer many of those questions. According to Igor Zudov, the deputy editor in chief of Science in the USSR, the editors are incking forward to the exchange of magazines and to a long and beneficial relationship with Ornov Zudov will write the First Word for Omni's Soviet September issue

The importance of outbrail exchanges between the East and the West cannot be ignored. "One of the most important reasons in have exchanges in experience of both countries to the educate entirens of both countries to the residities of the other and to organd horizons," explains Greg Gurott chairment of the President's US-Sowiet Exchange initiative. Quantity office provides high to those Gurott's office previous high to those Gurott's office provides high to those

Americans structuring exchange programs. According to Guitott. "It is in our best interest to demonstrate to the Soviet public, a public that has been given a very nerrow view of the United States, a sense of the diversity and vitality of American outure." Ornor intends to do just that DQ



Omni. Opening the international curtain

NEWS FROM THE CUTTING EDGE OF SOVIET SCIENCE!

SCIENCE IN THE USSR

The bimonthly magazine of science and technology – now available in the United States in this special limited-time offer.



Medicine. Computers. Technology. The Environment. There's a wealth of crucial research being done in the Soviet Union today. Mysteries being investigated. Problems being solvad. Discoveries being made.

SCIENCE IN THE USSR brings you the panorama of Soviet science and technology – six times each year, in full color magazine format. Published in English by the prestigious USSR Academy of Sciences. SCIENCE IN THE USSR is now available to U.S. readers,

-	USSR is now available to U.S. readers, for a limited time, only in this offer. To order, return the coupon on this page, or the card attached, with your payment.
	SCIENCE IN THE USSR
	☐ Yes. Enter my subscription to SCIENCE IN THE USSR immediately. I'll receive a full year – six bimorithly issues – for just \$30.
Ì	Name
i	Address
	City
ı	StateZp
ı	☐ My check or money order, payable to OMNI, is enclosed. I'd prefer to pay by credit card. ☐ VISA. ☐ MasterCard.
i	Card noExp
	Signature
	Ctp and mail to: OMNI/ SCIENCE IN THE USSR 1965 Broadway: New York: NY 10023 H48si

THE CHEMISTRY OF REEFER MADNESS

By Leah Wallach

It makes Homo sapiens hungry, horny, drowsy, and glad—or anxious lit dulls pain, inhibits movements, lowers body temperature, fools time. It sets memory chasing its own tail and turns thought and perceptual processes awry. Why.

For decades there were as many theories of how people got high an pot as there were researchers interested. in testing the 421 compounds found in mariuana's serrated green leaves. Some scientists thought the weed's active compounds just dissolved into the membranes surrounding brain cells Others believed the compounds worked through receptors, specialized areas on the membranes that fit lock-and-key style with specific molecules. One prominent neurochemist confessed to three motebooks of experiments that had failed to find a neuronal lock for a Cannabis sativa key. No one was able to figure out exactly how marituana really did work (inti) last weer

In the fall of 1988 pharmacology professor Allyn Howlett and her group at St. Louis University Medical School announced that they had found the recentor for a major cannabinoid

тојесије The story of Howlett's discovery becan in the States, when Balari Mechaulam of the Hebrew University in Jenusalem determined that the main mariuana was a substance called delta-9-tetrahydrocannabinol (THC). Although not especially potent. THC represented a new class of compounds structurally different from those found in other assochaactive drups. Drup companies were intrigued. "If you look in an old pharmacology text from, say the Twenties before the Reefer Madness business." Howlett explains, "extracts of cannabis were about the only compounds that could be used for pain relef and arreiety" Subsequently pharmacologists began synthesizing THC analogs called cannabinoids. which were chemicals structurally and biologically similar to the naturally

occurring chemicals but more powerful

in the mid-Seventies Ross Johnson and Larry Meivin worked with synthetic cannabinoids at Pfizer, a Connecticutbased pharmaceutical company They were trying to develop a THC-like anabesic. The problem. Motivin explains. was that they couldn't detach the painkiting from pot's psychoactive properties. They developed several compounds 100 times more potent than THC, but the animal (and, in one case human) subjects were zonked. This meant the drucs could be used only in hospitals, where opiates hart airearly cornered the painkfer market. In the early Eighties Pfoyer stopped the research project. The academic community took over and began studying the Pfizer

cannabinoids.
When a compound locks into its receptor on a cell membrane, it changes the activity of structures in the membrane, which in turn afters the way the cell processes information. Howelf wanted to see if the Place cannabinoids worked the way own other enablescence of the processes of the processes of the place cannabinoids on the place of the p

way the inside of the cell responds to messages received at the membrane Howlett found that the Pizer cannahinoids-especially the potent Levonantradol—affected cAMP production in cultured mouse neurons by inhibiting a key enzyme. The more effectively the compound inhibited cAMP in the test tube, the more effectively it killed pain in animals. Howlett's next sten was to see if the cannabinoids actually attached to neuronal membranes. She labeled the compounds radioactively, and by tracking the radioactivity, she was able to show that the cannabilloid malecules bound fightly to the membranes. "The compounds that bound most strongly were the ones most active at the cellular level, and in the animals And that," she says, "is what really defines a receptor." She also found-nothearts might be interested to know-that the cannabinoids did not burt the cells. After exposure for saveral



High-brow receptor. Manjuana chemical lock and key is found mainly in the front brain.

18. ONN.

HEAVEN'S SCOPE

STARS

By Riccardo Giacconi

hen the Hubble Space Telescope (HST) this off with the space shuttle Discovery next year, it will take with it the hopes of thousands of people who have dedicated their lives to it.

The HST is the first of the great.

observationies that NASA plans to put into space within the next decade. It will be the largest divillan observatory ever folled. The size of a school bus, it weights all of 12.5 tons on the ground. The HST prossesses a 44-inch reflect-

ing telescope and the other major instruments two camens to image pictures in the visible utilization, and transport in the visible utilization, and utilization charges of the spectrum, two spectrometers that record distain the opicial and utilizatiotal branchs, and a photometer that measures visible light. Software programs, run on banks of computers, control the HST and manage the state collection.

By placing the HST above the obscuring blanket of the atmosphere, we will be able to see images 10 to 30 times sharper than ever before. This improvement is equal to the one achieved by Galileo when he first used lenses to commer the heavens in 1609. To illustrate the HSTs potential impact, considering yow miterest, cosmological research. One of the biggest cosmological research options to today concerns the formation and excution of the universe after the Bang. At the moment the file span of the universe has been determined only with the precision of about a factor of

two. That is, it could be as short as 10 billion years or all long as 20 billion. Why do we want to know the unwested age more precessly? Because livravi-edge of this cosmic clock is necessary to understand how the galaxies the stars, the planets, and, finally, tils itself tomed and evolved. The HST should be able to zero in on the surverse's age to within 10 meters.

The HST's flight was first scheduled for 1984. This holdup, caused almost entirely by the Challenger trapedy, has created problems for a generation of astronomers. Because of the delays—in the HST and the space process in

d general—there has also been something of a hatus in snace astronomy.

This has meant that the computer hardware aboard the telescope is did technology. There is a juble going around that floding be personal computers are more opinisticated and powerful than the computers aboard the HST is a list of curre, but with a the HST is a list of curre, but will not be a reliant to carry out. We just need to do more thinking on the organized to do more thinking on the organized to the list.

The flight of the HST will provide a great challenge to the Space Heiscope Institute staff. We are the first member of the scientific community NASA has entrusted to conduct one of its own programs. This will test our ability to change our viewing targots whom unexpected opportunities arise, such as unexpected opportunities arise, such as unchained airwal of a cornet. The funding well disperse on behalf.

of NASA to the user community will aud greatly in making the best operation use of HST. These funds are roughly equal to the committee of National Science Foundation grants for all of astronomy. They will be for analysis of the telescope's data. What's more, there will be about 50 postiodizoral fellowships run by the institute as well as 50 unand faculty loositions funded by NASA.

Finally, we expect the participation of ametical astronomers, who will get some of their own observing time on the HST We hope this will lead many young people to become curious about astronomy and science.

During the next 15 years of the HST mission we will discover much. A future generation of astronomers will be looking to answer even more difficult questions than we are posing flotby. This will lead them to build a more powerful space felescope, poshage even to create a new astronomy. For me, all of this is ording on the launch sext sorries. Od



Hubble, Hubble, toll, and trouble. Next year the telescope will finally sour.

20 OMNI

Riccardo Graccon has been the director of the Space Telescope Institute since its creation in 1981

LASSOING THE CACTUS BANDIT

EARTH

By Jonah Houston

In January 1986 a 19-foot sequence cactus was solone from Quartitete.
Arizona waverup positiers of the multilarmed succlear's were put up all the Anzona border. Then a tip came A corespounds exclusioned was exported on set et at Las Vegas nursery for \$15.00 the report occupies who had reported in a police from the provided of the pr

In the dissent, where the magnificent lanned crests of the sagurar charges from the sagurar charges from the sagurar charges carbons, caches rushing is on the rise is so widespread in fact, that the Anzona Commission of Agriculture and Horticulture has a force of 120 carbon cope's to protect the fragile state symbols from abductors.

Last year 201 investigations led to 70 contrictions, 123 lines, and the contiscation of 75 paints valued at a total of nearly \$15,000. On the black market the pittered plants draw approximately \$30 per bot plus \$50 per arm says often Cross, an officer of the Arzona Fish and Wirdlife Service. "It's kind of hard to catch (the thiswel) as fast as they can pull the cactus from the ground," says one enforcement officer.

Sitt, the cactus-protection plan seems somewhat artifary. On one site, the cactus cope often spot-check for unregistered succusients by mighig doorbiels and confectating property—legally acquired plants must have accompanying permits. On the other side is blatiant disregard for the disent trees: Developers are buildrong across of each that dot the palts of new golf.

courses and other development siles. Until the year the state's enfousied native plant laws, written in 1829, required developers only to submit a surple written notice stating their infent to clark. Having net this requirement, developers were allowed to phore over cores of parts. Nor and rail Pri Patella, burdhers with naive bear in the plant received their plant of their price of their price of parts. Not naive bear in the plant received their plant of their price of their plant and their price of their plant and their plant plant and their plant pl

dictates that he should enforce the law not necessarily protect the plants, says Not Hebets, who is a lawyer. They are enforcing ten archaic statutes with modern standards," he says.

But with the efforts of the Hebets.

brothers, It is changing. Phil Hebets has noneered a technique for transplanting desert trees, something thought impossible as recently as three years ago. Salvagers remove a tree by handdigging a trench around it, cutting off teerier roots, and building a wooden box around the taproot. They leave the tree this way and water it continuously. for two weeks. When the tree has adapted to the loss of its feeder roots, the salvagers cut the taproot and place the tree in a nursery, where it is watered by an underground irrigation system. In the past people attempting to move desert trees were unsuccessful because they used backhoes, damaging the roots and eventually killing the plants A committee of representatives from 26 other plant-related industries in the state, led by Noel Hebets, has set



Where do they fence stolen succulents?

out to charge the live. After an arthurus battle new legislation has been proposed that will reduce the number of standards mit American rainly plint live standards mit American rainly plint live membe categorizing parks into proceeding operations, and seals Other charges movine less for tings and seals Other charges movine less for tings and operations and much properly of less than one acre and much properly of less than one acre build mit and the provider with the charge in the charge in the charge in the control of the charge in the charge in the charge in the control of the charge in the

Dan James, conservation charman for the Arrans Nafive Plant Society, claims that it was once faster to buildrace plants than to transplant them. "But now the state can make money on bagging fees, money can go to measurch and development, and the state can increase the number of caches cope," he says. According to one local resident.

however, the cactus cops continue to focus their attention on individual cases of little consequence. Julie McDonnell Johnson is "furning" at the "distorted lies" about a crested saguaro confiscated from her husband. Carl. Two years ago, after her husband was accused of cactus theft, Johnson says her thirteenyear-old son was "estracized by neighhorhood children, our neighbors stopped speaking to us, and a business that was doing extremely well has fallen short." She also says the family had to get an unlisted phone number because of anonymous calls accusing them of being "cactus thieves." At a court hearing this year it was decided the cactus had been legally tagged and removed from a legal area

The rory Julie Johnson charged in a failer to The Phoenix Gazette, is that before the and the facilities of the behavior of the phoenix of th

FRUITS DE MER

By Mary S. Glucksman and Eleanor Smith

liven hefore an outramed public began responding to man's destruction of the oceans concerned scientists were worried that enfire colonies of marine life might be following the path of our dying rain torests. Ocean ecology is not as fully understood as its terrestrial counterpart. says Marthew Suffness, program coordinator for natural products grants at the National Cancer Institute (NCI) in 1986 this unit launched an ambitious organization collect and ecreen marine organisms for compounds that can be used to fight cancer "It's not going to be possible to undertake a program like this in twenty years," Suffness says. "Certainly there will be fewer marine organisms available." Chemists amund the world are now scouring remote areas of our seas to collect organisms with unique chemical and molecular structures. The marine environment, they say, could provide a rich array of novel drugs. Already the first wave of marine pharmaceuticals is breaking. US doctors are conducting clinical trials on a new cancer drug derived from sea squirts and preparing to begin trials on two more cancer drugs and a unique

ant-inflammatory compound The scientists' work is going slowly because they have only recently acquired the tools to obtain specimens from deep-water babitats and the chemical technology to accurately isolate and analyze the substances sea creatures contain. The amount of time that passes between the discovery of a promising marine-derived compound and the end of clinical trials is generally 7 to 14 years. Financial obstacles also frustrate the scientists' Development costs of \$60 million to \$125 million necessitate the cooneration of major pharmaceutical houses-something not always easy to get in an economy oriented toward immediate rewards "There's a real reluctance on the part of US industry to fund anything long term," says Dick Moore, a marine chemist. at the University of Hawaii. "Americans look only six months down the road, and OMN

that's point to kill us in the long run." Moore says the Japanese effort to exploit marine products is an example. the United States should follow The Jananese Ministry of Transportation recently typical two justitutes commissioned to develop marine pharmaceuticals. The Suntory beer company headquartered in Osaka, provided the Australian government with funds to renovate a marine biology lab on Lizard Island off the Great Barrier Reef, and huild an oceanmond catamaran equipped for manne pharmaceutical resparch. Suntery has also dispatched. two staff members to the Rosenstiel School of Manne and Atmospheric Sciences in Mami to help screen marine organisms for useful compounds.

While several American pharmacoutical mants, notably Upjohn and Bristol-Myers, are developing individual marine drugs in conjunction with university research labs, none have made significant efforts on their own. Dr. Koii Nakanish: a director of the Suntory Institute for Biographic Research, criticizes



Rx for arthritis: Chemicals from a sponge?

American companies for their shortsightedness. "You have to realize that the search for drugs from terrestrial plants has been going on for three hundred to four hundred years." Nakarishi points out. "This is a newer effort. and will take time. Eventually, I'm absolutely gure, there will be a generation. of marine pharmaceuticals

Dr. Oliver McConnell, division director of the Florida Harbor Branch Oceanographic institution's five-year-old higmorkeal marine research division says he is pursuing active relationships with several large pharmaceutical houses. A nonprofit organization with an NCI grant for collecting specimens the Harbor Branch team is looking for compounds with four different types of disease-lighting activity: antitumor antiviral, antifunnal, and immunomodulatory (able to stimulate or suppress immune system response). So far McConneil says, they have isolated a half dozen compounds about which they're particularly excited. The next stenis to interest pharmaceutical companies in investing the time and money necessary for development. The effort could be well worth the initial investment William Fenical, a marine chemist at the Scripps Institution of Oceanography. says a new improved arthritis doug, for example would reap a billion dollars a year for the company that develops it.

According to Suffness, species extinction and lack of funding are not the only problems impeding marinepharmaceuticals researchers. The countries where scientists collect raw materials are not reaping the benefits of research expeditions, he says. As a result, scientists often find relations with host countries strained, and local governments have become much stricter in granting export permits for materials collected. Without adequate access. to a new substance, chemists' ability to gauge a new compound's activity in the body is hampered. "Supply of compound is a major problem." John Faulkner, a marine chemist at the Scripps Institution, says "We literally go through CONTINUED ON PAGE 97



FCOLOGY WARS

unay bosonini calasi Edward Abbay anto his more companied to the companied

normatics, and the residual between the value of authors modeled and semocratic bocasism or recent Orsen Party platforms, bolless that only humanism of cream Party platforms, believe that only humanism can adver the problems we have created and see as a catedorars, showers or nature. The created are properties or the problems of the problems of growth and progress-orwined system that begain with the firgrowth and progress-orwined system that begain with the firsubstantial Revolution and as now threatening the plantist very surwald. The problem is marris growthm or and progress of the problems of an one threatening the plantist very surveid first problems is marris growthm or an extra state of the problems of th

per not yet, strates related use week! You could receive the the many problem? They believe the exists, which they some three call Gase, as a complex organism with it is own needs mediatelism and name eyestem and the marked or destinot the earth is noneasity parasitio in Deep Ecology. Lung Neture as if Metric Methods, propriets it harmen takes on organism three and the contract of the contract of the contract Sessions clearly state the repropers it harmen takes on organism create, the character of harmen the sard cultures is compatible exect, the foundary of harmen the sard cultures is compatible three or contracting the contract of the contraction.

Their approach may or may not impress the anthropocentric Mr. Bookchin, the Greens, ecofeminists, the park services, or Sierra Club liberals. Certainly it will not convince Sagebrush. Revolution reactionaires fromember James Watt? For the many commercial interests that, with government support or tool permission, are freshing nature files a pig at a barbecue. But deep ecologists insist that the population must be reduced drastically, not for simple Matthusian concerns about food distribution but because in our present humbers we are dangergus to the cartifis health. When mans signed contrible, with

Farth's needs Farth comes I

Angue of collegated such as Earth Frest memoric New Common and Alland Scholar Scholar

passion and should serve to challenge and test more moderal funking, just as Bookchin and the Sterra. Club find toots an furths the radicals can tisse. To this armobiar environmentals at these groups seem useful and if Earth First takes extrem positions we can remember and vender how far the norw lence of Martin Luther King would have gotten without their elect threat of Martin Luther King would have gotten without their elect threat of Martin Luther King would have gotten without their elect threat of Martin Luther King would have gotten without their lends threat of Martin Luther King would have gotten without their lends threat of Martin Luther King would have gotten without the second second

If you've been thinking that you missed all the good revoluons, think again As Sim Pickens said in Rancho Deluxe uposeing a new Cadillac shot full of holes with a Sharps buffalfile. This is gottin downinghi romantic —RICHARO HILL.

Richard HW is working on a book about ecosabotage. He ha written for Esquire, Harper's Rolling Stone, The Village Voice



Her mother had been taking her to doctors for years. was five she had been tested and unnary tract. She was The girl was a victim of a

OMNI

In this variation, the narentusually the mother-invents

of Mississippi Medical Center

cally, they found, the parent

Although difficult to detect at

-- Henry Wouk

The structural detects that pany in Huntington Beach, embedded in aircraft con-Senior staff manager Enc. Udd, who calls the sensory

so small," he says, "that strength of the material"

age "In addition to aero-

- George Nobbe "My loathings are simple

Name the greatest of all



dar cheese--is Cheez Whiz

form of a polyunsaturated fat

Panza doesn't suggest a intake that includes foods

-- Bill Lawren

Around a p. 100, Roman on the chilly, northeastern Great Britain, researchers are The documents, which

interpretations," notes Tmothy

written on four thin wooden state" Potter relates "That

plaqued many soldiers. A

pier," Potter says "So she pairs of socks, and some un-



100 (hailing Ash weather wasn't the only thing Roman's

CONTINUUM

NOSE TEST FO

Right naw, the only way to prove that a period suffering from imparred thinking and behavior has Alzhemer's disease as to wait until the dise Then his brain can be secrebed for the tangled cell structures that mark the degenerative brain clease. But in the future researchers may be able to dispose the properties of any properties of such as the properties of non-the properties non-the properties non-the properties non-the properties non-

included and New England Medical Certific points of the Medical Certific points out that most Authennie's pelients suifer a defective sense of smell, which occurs early in the ocurse of their desires "Ottactory areas of the brain are invariably affected by Abbenner's, so it seems possible that the oblasticity nonveicities in the nose might also show noundedgenerate changes," she says. To test this theory, Talamon.

and other researchers recently conducted a preliminary study of nose tissue rom nine people whose judopsies confirmed that the lad suffered from lizherner's Eight of the inwere found to have nerve there containing proteins jumilar to those associated with the tangled nerve fibe tipcovered in Alzheimer's

Talamo is planning to stut nerve fibers in the noses of lung Abberner's patients soon. "We want to see if we can correlate the biopsy findings with the progressio of cognitive and neurologic changes that mark the disease." says Talamo

Developing a test for the early clagnosis of Albremors can't come a minute too soon. Talarno emphasizes: "As many as four million people may have the disease. And as more agad people live langer, Alzheiman's is going to become an even bigger problem."

Sherry Bakar.

"The advantage of a bad memory is that one enjoy several times the same of things for the first time."

seizures, the brain toggers



Creepy cures. A synthetic drug derived from spider vonom may lessen the long-term effects of a stroke.

INCRES OF THE SPIDER
MEDICINE
When a spider attacks an
macel, its verom disables
the victim by blocking the
dark b

strokes and seizures.
"We would not use the whote venom, just a single molecular entity," says Lam-

pert, explanaring that the company is studying as characteristic papers of succession of the second of the company of the second of the company of the company of the company of candidate for claimed fines from a last of srachnold. We like Philapses primping spoke two as last of srachnold. We like Philapses primping spoke two second of the whose venome are harmful for insects but not humans. Once bound, the venome can be used to develop synthetic drugs that will block cooses glutametes activity in hu-



the nase h



Planet envy? Mars may turn green if scientists manage to seed its air with life supporting oxygen.

BLUEPRINT FOR LIVABLE MARS

Science-fiction writers have long been fascing that have long been fascing leads as experimental laborationes but now a Source scients suggests making that old science a resetly Specifically, Gernith Avainesov of the Sovet Space Research Institute in Moscow is calling for a massive experiment that would provide Maris with an oxygent results of the second specific services and several results of the second services and services and services are services as the second services and services are services as the services and services are services as the services are services are services as the services are services as the

The plan. Avanesov total a construction of the construction of the

few thousand years, Avanisov maintained, the Manhaniar would be so "polluted" with oxygen that humane could actually breathe it. But would it work? "There's absolutely no question that it's doable," says University of Michigan booligat Robert Bender, "and the first step could be liken in our Eletime

Michigan biologist Robert Bender, "and the first step could be laken in our filterine. The difficulty is not the biology, it is the engineering. Where do you then disperse them in a thin enough layer so that they lake hold, that sort of thing? But he adds a significant caves! "We have to ask curselves if we really want for an the risk of contaminating Mars with an also life form"—Bill Laweri.

of furniture for a man's upper chamber, if he has common sense on the ground floor" —Oliver Wandell Holmes

00110017010

By 1992 GWEN will be broadcastring in every state in the United States But you'll rover hear the radio notwork play Maddonne's latest hit or an Else Projet golden dide GWEN, an acronym for Ground Wilese acronym for Ground Wilese Chief genry Network in the Emergency Network in the Emergency Perhaps of the Chief Chief

Force Base in Massachusetts, relates a scenario that could make GWEN the most important radio network in the country "If an aggressor delonated a nuclear bomb high in the atmosphere, we wouldn't feel the blast on the ground. But it would are ate an electromagnetic pulse that would disrupt req national command authority would need a way to quickly had been a mistake. By tuning in to GWEN, the Presi-Pentagon and strategic radar and air command

The \$600 million GWEN notwork would still operate because it uses low-frequency (150 to 175 megahertz) radio waves that hug the ground, avoiding upper atmosphere disturbances. Gilmartin explains that the ra-

200 miles apert from coest to costs. So far \$2 doorneday radio towers inveng 38 terminals have been built. The Ar Force excertly announced that the operating system will be expanded over the not two years to \$6 towers and 49 terminals cepable of both necking and sending years to \$60 towers are \$600 towers are \$600 towers are \$600 towers are streety broadcastina. Gil-

mostages
(WEN radio towers are atready broadcasting, Gil-martin ports out. They beenly minutes, for about these seconds, they put out data; he says "The four these seconds, they put out data; he says "The four these seconds have been to the set put mises auto minutes of command and the second the second to the services object to having a tower or terminal but in their community. "Some oppose officers object to having a GMEN because they associated they associate they are they associate they are the are they are the are they are they are they are they are they are the are they are t

—Sherry Baker

"As soon as any men says of the affairs of state, What does it matter to me? the

does it matter to me? the state may be given up as lost."
—Jean Jacques Bousseau



Postnuclear broadcasts are ready to air

CONTINUUM



developed a resistance to drugs not yet discovered?

SOULS ON IC

It began as one mystery, and ended as another in 1845 the British oxplore Sr. John Frankin set out with 1s other integral souls to find a northwest passage access the Canadian Archa None-the explorers ever returned What happened to thom? Lest year Canadian anthropologist Ower Beattle (ed another expedition to try led another expedition to try led annother the property of the prop

Beatte and his team unchowed the bodies of two members of the original supedition on Beachty Island in the Northwest Territories. He took teaus samples from the perfectly preserved feases corpies and sert them to the University of Alberta Hogistas in Edmonton, where they were examined by microbiologist Kinga Kowalingska Groothowska Looking.

for exidence that the applicates had been killed by an infection, Kowalewskia-Grochweskia did a routile test in which she exposed bacteria found in the explorer's assues to a spectrum of artistictics. Since artishotics had not yet been discovered at the time the explorers dead, Kowalewskia-Grochesto be sensitive to all the artishotics instead, they were resistant to at least

plete surprise," she says.
The mystery, of ocures, is
how the bacteria could
have been resistant to drugs
first had not been invented.
Kowalevskia-Grochnwiska is
now conducting further tests
she says, "to find the underlying mechanisms" for his
resistance. Noting that the
explorers' tissues showed
him levels of level—conduction.

from eating food from in cans with lead soldering she speculate that the limit have generated a mitor in the bacteria that rendered them resistant the antibiodics by sheer chance —Bil Lawren

FORGERY FORMULA

algorithm or formful, for use with a security system that welfules identifies by analyzing signatures Signature with signatures Signature with IBM has been widning on it for more than a decade, but includely a signature is always consistent, a human signature in the computers are too rigid in their readings they're likely to regict people who actually are who they claim to be Too flestble, and

a forger can slip by Early approaches meesured hand pressure and speed in small segments of a nventors Thomas K. Worhington and Steven C. Sunderson at IBM's Morkedelights, New York, facility look that one stop further. They devised and patentic an algorithm that computes ar more sensitive aspects a human signature. For scample, the system record he number of times per record that pen pressure.

part of the hardware.

The algorithm compares
two sets of data once when
you organish enroll in the
system and then each time
you sign on, "explains Worthington. The computer
compares two signatures
before authorizing identifiance
to anything from automatic
taller machines to a personal
computer terminal

The past is gone, the present stull of confusion, and the uture scares hell out of me?" —Dawd Lewis Stein



dwitting analysis. A new comput

panes-on the head of a

scope, which emits a beam eter of a single atom, to faces. With this beam, Huma billion holes on a pinhead, enough to etch the entre room to spare. "The precibe comparable to sitting in one hundred miles loog.

and by Scotland Yard, both cations far beyond the more

out viruses in the laboratory or even single molecules.

might be able to build a

an hour, whatever he does,



according to David Williams.

When a fellow says, 'It ain't

CONTINUUM

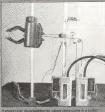
MUSCLE-BOUND ROBOTS

of conventional robots have been limited by the relative heaveness and slock of flexibitly of their mechanical insucles." But a term of British researchers is attacking the problem by inventing a system that combine chemistry with hung misterials to produce an "organic" muscle that between much like the human variety.

Dankin Calchwell and Paul Taylor of Hull University built a watertight chamber containing a series of get strps made by combining palyonyl alcohol and polyacytic acid. When water is audied to the chamber, the get events Replace the water with acciden and the get shrines. This swelling and shrinking cycle mismics the experision and contraction of

Calewell and Taylor then place the orl these charm-bers ade by side and hooked the gel stripes up to a set of were. By controlling the input of water and acetione (in the case), by computer), the gel stripe can be made to atternately taylors and relax the wires. The wires can then open and close a pair of metal "Ingers", imitating a grapmer movement.

grapping movement. So far the strength of the grip is much weaker than an average-ettenight handshake. The scientists are currently experimenting with chemical ratios that will increase both the power and the speed of the contraption. But theoretically, says Caldwell, the system can perform well, the system can perform



Muscle movement may be just a matter of time

'virtually any motion a muscle can do' in ten years or more, he predicts, engineers may construct ammated robuts powered entirely by these polymyr muscles. Does this meant well eventually have a robut baskbottally have been and out quickly enough,' says Caldwell. But I think that worth happen for a very long time."

"Everything has been thought of before, but the problem is to think of it again" —Johann von Goethe

"The trouble with our times is that the future is not what it used to be." —Paul Valáry

Its regiment of the Assaux. Native America minimated centrely by Southwest from 400 to 1930. Southwest from 1930 to 19

Yes, the peace-loving Anasaz may have been cannibals, according to archaeologist Jeannette Mobiley-Tanaka, an anthropology assistant at the University of Colorado Museum and crew chief of the Yellow River dig. She and her team have building, dating from around 1250, this contains some gristy exidence. A stack of four hundred thirty individual bones from approximately fain individuals were inseed logether. Moley-flaneks explains. They were burned and cracked open, we think, so the marrow could be extracted and eaten. Axis and knives, which Axis and knives, which

may have been used to kill cannibatism victims, were also discovered near the fire pit, Mobley-Tanaka says "Cut marks at the base of skulls suggest the victims were decaptated"

And there were other clues evident on site. "Cannibalism is often involved with ittusiism," Mobby-Tanaka explains. "And the way the bones were disarticulated and mixed together suggests a

Were the Amassaz driven to sat human flosh because of hunger? That's very unloopy. Michely-Brankis says firer study of Amassaz skolotors reveals a people who were well horushed. Be ades, 'she addis, cannibalsm is not a very effective means of awarding star viation.'—Shenry Baver.

"People say that life is the thing, but I prefer reading" —Logari Pearsall Smith

done, they've seen it done every day, but they're unable to do it themselves."

—Brendan Behan *Man. an anmai that makes

> ns." —Adam Smith



ARTICLE

Some experts believe we can make babies smarter and happier even before birth

PRESCHOOL?

BY PAMELA WEINTRAUB

The routine was always the same:
Each evening after her husband had
gone to bed, she performed her
Lamaze breathing awards with the street of the street of

and left truly happy."
As early as is morths after her child was born, the mother notioned that her son would stop whatever he was during would stop whatever he was during the was during the MAYS'H theme came on: "He is now how years clid;" the mother says, "fand no matter where he is or what he's doing, when the son't comes on he stops and stare, almost as if he's in a trance. Every time this happen," which shaded and lare amazed."

This story is not as unusual as it may seem in anecdote after anecdote, people have reported memories, personal qualities, and even aptitudes obviously accurred

PAINTINGS BY MICHAEL PARKES

belore brith—not through genetics but was sounds, wherefore sever feelings, traveling from the external world to the wornt-Another mother, for instance, recalls the day when, sitting around the dirring room state, size piece doors the pregnant with herein frequently worn white pregnant with her this little gri. Too you remember those prajamass? the three-year-old gril was facetor size several.

The child's enswer floored the group: "I couldn't see what you were wearing, I could only hear what you were saying," the gri replied.

"What was it like?" the mother asked "It was dark and crowded, like a big bowl of water."

"What was your favorite food?"
"I didn't get any lood."

"What did you think when you were born?"
"It wasn't crowded anymore," said the ort "I could stretch."

"The amazing thing," the mother explains, "is that she described the entire experience without ever saying she had seen anything. She described only what she had heard and left. She never shaped or answered is duestion winon."

These stories make sense in light of new research proving that unborn children can see, hear, feel, and perhaps even form a rudimentary level of awareness in the womb. Indeed in a startling series of studies that have been conducted over the nest decade, psychologists have shown that prenatal life and the birth expenence may be protound determinants of human personality and aptitude. Countless musicians, for instance, were exposed to music during gestation. And time and again psycholonists have traced such qualifies as selfconfidence depression, or addictive behavior to experiences in the womb.

navor to expensences in the worms, it is every parent's dream to manshal such findings, optimizing the emotional and interfectual potential of their children And now, thanks to the burgeoring new field of pre- and perinatal psychology the neurological and psychological study of babies before and during birth—that,

dream may be fulfilled On the most basic level, experts such as Toronto psychiatrist Thomas R. Verniv have begun to help parents establish two way communication between the outside world and the womb. By singing and talking to the fetus, parents create a positive intrauterine environment, reducing the level of anxiety-producing hormones that lead to frenetic activity and even ulcers in the unborn. Other researchers have none much further constructing stimuation systems based on language, touch, and beart drythm. When transmitted to the intrauterine environment, the researchers claim, these stimuli improve an individual's lifelong ability to learn. And in what could be the most radical aspect of prenatal psychology, some psychologists say they've proved that we sometimes remember our birth

White pregnant mothers have touched and talked to the unborn through the barrier of the women from time immersional, the field of pier and pointfall psychology the field of pier and pointfall psychology the field of pier and the properties of the prepared to a security of the parties of the cussing a dream. Verry recisit, "this parties that parties are the properties of the trance, and when he came out of this all trance, and when he came out of this all trance, and when he came out of this all trance, and when he came out of this trance, and when he came out the trance, and the trance, the

genly found integer in a size crib and ne was crying for his mother. As a matter of tact," he said, "I even remember the crib, and it was white." After considering the scenario for a white however, the young man con-

cluded that the vision was farrasy and nothing more "In all my baby pictures," he said, "the crib was blue" "Talk to your mother about it," Verny in-

Countless musicians were exposed to

music during gestation. And psychologists have traced such. qualities as self-confidence

and even depression to experiences in the womb.9

sisted, "and see what she says."
"This is truly emissing," said the young man the next week, when their talk resumed. "It seems that my parents were very poor when I was born, so for a few months. I was sleeping in a borrowed white orb. After two months my griend-mother cake my parents some money.

and they bough is orth, and it was bus? Verry head other stones as well. Many went back not just to earliest infancy but literally to the womb. Ohe mother for instance, recalled a Peter. Paul and More song she had surg repetiedly during her programpy. After the barth of her chick, that song had a misgled effect on the infant. Song had a misgled effect on the infant. where we had not some since the where we had not some some part where we had not some some part where her in mother started singing that some—and that some since—they would

quiet down.

Another woman was surprised to find her two-year-old daughter sitting on the living room floor charting. Breathe in, breatheout, breatheout "The words were part of a Lamaze exercise the woman had practiced during the last weeks of her pregnancy. She had not ut-

Sitting in his sooting, entique filled of lice, with a potted paint yit he stainedgless window and tapestines on the wal, herry recalls his doubt. "These things were totally anotherns to me," he szys. "I did not went he hear it! went to school here in Toronto, which is very consonutive. I spent a year at Harverd, where psychonalysis were the rule. This was not something it wanted to believe."

Despite his skepticism. Verny decided to begin a literature search that would take years. When he was finally through, he had come up with a totally new picture of the unborn.

Much of the research gathered by Verry concerned the sensory capabiltee of the talus in the womb Byth fouralt morth after conception. Verry learned to the sensor with the conception which are the conception with the conception which were stricted. And if a buffer submode like incident was introduced into the armsoile bud, the various method would gir and it he same age, the bashy could perceive a bright light stringer on the order of a buffer was particularly being the first submitted to the order of the buffer was particularly being the first sound or was provided period to the provided the provided to the conception of the provided to provided to the provided to provided to the provided the

At five months the same child would react to loud sounds by rating his hands and covering his ears in a schise of remarkable studies conducted during the early Eightins, moreover, University of North Carolins psychologist Anthony DeCasper showed that the human new-

born recognizes his own mother's voice In one study, DeCasper asked 16 preg nant women to tape-record their reading of three different children's stories. "The King the Mice and the Cheese' and two different versions of "The Cat in the Hat. During the last six and a half weeks of pregnancy, a third of the women read the first story aloud three times a day, a third read the second story aloud three times a day, and a third read the last story aloud three times a day. When the babies were born. DeCasper and colleagues offered each infant a choice between the story its mother had repeatedly read and one of the two other stories

To enable the babies to cast their vokes DeCasper invented the "suck-o-meter"-a nipple hooked up to a sound systern in such a way that a baby can switch between two taped voices simply by changing the rhythm of its sucking. The findings? Shortly after birth, when the he bies were tested 13 of the 16 adjusted their sucking rhythm to hear the familia. story as opposed to the novel one. These data provided the first direct evidence that newborns remembered something about speech sounds during the last six and a half weeks of gestation. In yet another study. DeCasper showed that the new born recognized its own mother's voice. In addition to these sensory abilities

Verny discovered, the baby in the wornb had the neurological potential for a rudi-

THE ROOTS OF PERSONALITY

Was your personality influenced by the sounds, whentions and chemicals that washed over you on the snewer that question, we present this question, we present this questionnalite. Developed for Other by Toronto psychiatrist Thomas R. Verry, founder and president of the Pre- and Pen-natal Psychology Association of North America, this questionnaire is the largest softeness.

sprey ever conducted.

Try to answer all applicable questions if you do not know an answer, ask your mother. If she does not remember or is unavailable make an educated guess. Send your questionneire to

Omni Womb, 1965 Broadway, New York, NY 10023

Age..... Sex.....
 Birth weight
 Condition at birth

a excellent (alert) b very good c fair d poor

e very poor (blue and not breathing) I. don't know Birth order a, first

b second c third d fourth e fifth f sidth or later Are you a twin?

a yes b no

6. Were you adopted?
a yes b no

7. Did your mother want to
have a before when you were

conceived? a yes b no 8. Your mother wanted a s boy b a gri c didn't matter 9. Did your father want to

heve a baby? a yes b no 10. Your father wanted a a boy b a girl c, didn't matter

 c. didn't matter
 11. Did your mother have any major calamities during pregnancy? a yes b no
 12. During pregnancy your

a happy
b. unhappy
13. During your infrauterine
Ife. did your mother talk or

sing to you? a yes b no 14. Did your father? a yes b no 15. During her pregnancy, your mother was exposed to

noise from a machinery b planes or trains



16. During your intrauterine file, you telt (circle as many

as apply)
a wanted b loved
c connected to you

mother
d to your father
e peaceful f anyous

g fearful h guilty i happy j bored is alone I unloved 17. While she was pregnant with you, your mother often

felt (circle as many as apply) a langry b fearful c aniquis d depressed

d depressed e happy if content 18. Did you dream in the womb? a yes b no

womb a yes b, no 19. During her pregnancy, your mother generally a smoked organeties b smoked marijuana

 b. smoked marijuana
 c consumed excessive amounts of alcohol
 d drank more than one or two cups of coffee

a day e used drugs, such as opcaine or herom f used tranquitzers or

f used tranquitzers antidepressants 20. You were born a in a hospital

b. at home c. elsewhere 21 During delivery your mother received a painkillers

b local anesthesia c. general anesthesia 22. Your birth was a vaginal, no forceps b vaginal, with forceps

b vaginal, with forceps c cesarean section d induced with Pitocin e breech

delayed (doctor not avarlable) 23. After your birth, you were a placed on your moth-

a placed on your mother's breast b put in a baby nursery c put in an incubator d, taken to a neonatal in-

tensive care unit 24. During birth, you and your mother were probably a in sync b at odds

a in sync b at odd 25 You are primarily a heterosexual b bisexual c homosexual

26. You like louching hugging and cuddling a an inordinate amount b. very much c. an average amount

d very little
e not at all
27. With food, you tend to
a overest

b eat until full c nicible d have trouble eating 28. In regard to sex, you (cir-

cie as many as apply)
a. can't get enough of it
b. have if on your mind
all the time
c. consider it important

a find it a prociem
e think you'd be better
off without it
29. You have at some point
been dependent on (circle

You have at some poi en dependent on (circ y that apply) a tranquilizers b antidepressants c sleeping pills

d pankilers e speed f marijuana g cocaine h heroin

30. Are you attracted to large, fat people? a. yes b no You suffer from a a learning disability b. penic attacks c phobias

d depression
e manic-depression
t schoopfrenia
g antisocial behavior
32 You sometimes dream of
a falling or trembling
b floating in water

c tunnels or openings d. quicksand or swamps e. shipwrecks or break ing into pieces 33. Areyou, or would you like to be, employed by a major

to be, employed by a major organization offering good benefits and a pension plan? a yes b no 34. You describe yourself as

a optimistic b outgoing c people priented

d pessimistic e withdrawn

g rooffess h cautious i reckless

aggressive k adventurous l prudent

35. You enjoy a getting shead b, diving into things c, exploring new hon-2008.

36. You fear a losing your temper b going crazy c becoming violent and destructive

destructive
d becoming helpless
e being raped
37. You often experience
a the inability to get into
what you are doing

b inexplicable fatigue c. lack of willpower d. intellectual stagnation e. the feeling that some

thing is missing 88. You try to avoid wearing a scarves b hats c turtleneois d neckties

a open spaces
b closed spaces
You react to stress with
a increased activity
b decreased activity

c immobilization d confusion e anxiety f anger 41. Record any intrauterine

41. Hecard any histauterine life or birth recollections on a separate sheet and attach it to this questionnaire DO mentary form of consciousness. To reach this conclusion, neuroscientist Dominick Purpura of New York's Albert Einstein Medical College used advanced microscope techniques to study brains removed from premature infants born of spontaneous abortion. Editor of the highly respected journal Brain Research, Purpura found that the human cerebral cortex-the seat of thought-forms the structure necessary for learning sometime between the twenty-eighth and thirty-second weeks of development.

Purpura also showed that by this stage fetuses' neural circuits are nearly as advanced as those of the newborn. Measuring fetal brain waves, other researchers distinguished between sleeping and waking states. And further studies showed that babies in the womb exhibit physiological measurements associated

with dream sleep Verny also came across a number of studies lying adult personality to gestation and birth. In 1974, for instance, University of Salzburg psychologist Gerhard Rottman studied 141 women, dividing them into four categories of maternal suitability, from ideal to datastrophic Bottman found that the women he labeied ideal (because tests showed they deenly wanted their children) had the easiest pregnancies and deliveries and the healthiest offspring. Those labeled catastrophic had the most extreme medhighest rate of low-weight, premature, and emotionally disturbed infants. The most interesting findings, however, concerned Rottman's two intermediate groups. These mothers claimed they were thrilled to be having babies. But Rottman's psychological tests-and, apparently, the babies themselves-detected something wrong. These unconsciously ambysient mothers cave birth to babies who were often extremely irritable because of custrointestinal trouble or simply nerves. Verny also took a closer look at his own friends and clients by way of a question-

naire. The more difficult their birth, he learned, the more sexual problems his respondents had. Moreover, a particularly difficult birth was often related to sadomasochism. "I use the word sedomasochism loosely," Verny says, "I'm not taking about whips and chains but rather the feeling that pain and pleasure are kind of mixed up in the sexual act

With evidence mounting. Verny decircled to form an association of his own. He also decided to mark the event with a conference inviting "those of us who didn't even know we belonged to a field so we could find a territory of our own" From this first successful gathering, a mediev of approaches emerged. Verny, the great synthesizer, has begun develoning techniques for soothing the unborn child, making it feel wanted and lowed. His new prenatal stimulation pro-

gram, still in the development phase, in-38 OMNI

cludes such techniques as rhythmic breathing, guided imagery, and "claying," in which prospective parents liferally sculpt the developing fetus out of clay In one exercise the mother soothes the unborn child through massage. In another she tries to relive her own birth by visuatzino a spoutino seed.

Other researchers claim to go far bevond Verny's brand of "emotional fitness for the unborn "Rene Van de Carr, an obstetrician from Hayward, California, for instance, has established the Prenatal University, in which parents-to-be "teach" the fet is through a complex system of

touch and words. Van de Carr entered the field of prenatal psychology much as Verny did. through a patient's compelling tale. In 1979, he explains, a prospective mother told him that every time she poked her haby through her abdomen it seemed to kick back. Van de Carr asked a few other pregnant patients to try poking or patting

Every time the baby kicks, we have parents poke back and sav. "Good baby, kick again!"

We find that . sometimes after a couple of

weeks, the baby kicks back immediately.9

the fetus. And invariably the result was the same. If parents consistently stimulated the unborn child through louch, the child would consistently respond Based on these observations, Van de

Carr benso working with groups of perents-to-be. Today he says, the complete Prenatal University course teaches the fetus to "pay attention," enhancing the spectrum of intellectual skills. In the first Van de Carr lessons, starfing around the fifth month of pregnancy, parents are taunht to respond to a beby's locks by pushing back 'Every time the baby kicks, we have parents poke back and say. 'Good baby, Kick again!' " Van de Carr says. 'We find that sometimes after a couple of weeks, the baby actually does kick back immediately. But that's not all. If the parent bangs the baby's foot twice, the baby will sometimes kick back twice. And if the parent bangs the baby's foot three times, the baby may kick back three

At seven months the Prenatal University fetus starts to master words. In twicedaily sessions lasting five minutes each. parents say, "Pat, pat, pat," as they pat

times

the baby's back. After a week or two other words are added. For instance, parents say, 'Rub, rub, rub " as they rub the bahy's back and, "Shake shake, shake," as they liggle the abdomen.

"Some of our patients also use drums and xylophones." Van de Cerr says: "We suggest the tubular xylophone, with which the individual can say. A. and strike the note A or say, 'B,' and strike the note B. This allows the baby to learn that events are predictable and that some sounds will

always be followed by others." Finally to prepare his near-term pupils for the months of infancy ahead, Van de Carr offers a secondary word list, including hot, cold, wet, eye, nose, and mouth Says Van de Carr. 'We're giving the baby a series of word tools that he or she will

begin to use night after birth Is the Van de Carr program, which the doctor himself calls "human davakonmental engineering," effective? Van de Carr says it is Histochniques have been used by more than 1 500 babies in countries from Thailand to South Africa to the United States, he says. And in a recent study conducted by his wife, Kristen, a clinical psychologist, Prenatal University parents were compared with a control group about 48 hours after birth. In general, she says, "we found that the mothors who started to connect with their kids in the uterus had a deeper knowledge of their babies. As a result, the babies were easier to manage and the mothers were in a better frame of mind

In another study Rene Van de Carr analyzed three groups of 50 children each. The first group included infants who were Prenatal University graduates. The second group comprised those who had had some exposure to the program. And the third aroun included the offspring of parents who had not participated in the program at all. Babies who had been strong program participants. Van de Carr found, spoke their first words earlier than moderate participants. And moderate participants spoke earlier than those who did not participate at all. Van de Carr tested other signposts as well, when a child first spoke a couplet of two words. when the child achieved object constancy (the ability to recognize when an object is present and when it has been taken away), and even when an infant first lifted its bead. In each case, he found, dedicated program participants scored significantly better than moderate participants and much better than those who

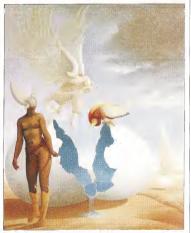
What was going on? "We're postulaling," Van de Carr says, "that the stimulafron literally increases the quantity of neural growth hormone in the brain. We also believe that the growth hormone is increased specifically in the brain areas we stimulate. For instance, when we play musical notes, we stimulate neural growth factor in the brain region for music. And when the baby learns to kick three, four,

did not participate at all

Six techniques that will return you to the moment of your birth

WOMB WITH A VIEW

BY KEITH HARARY



If you remembered being born, some experts claim, the experience might have a profound psychological impact on you. By getting in touch with your introduction to the world, you might begin to perceive your entire existence in a new light

But are reported birth memories pure fantasy as some critics surgest or is such recollection really possible? Though many people find it difficult to believe that cowhorn infente have the mental canacity to permit such early memories to reqister, many psychologists claim to have convincing clinical sydence that it can and does happen.

To assist you in exploring this possibitity we asked so leading researchers to suggest some simple everyises for inducing at least subjectively, the remembrance of one's birth. If you have a history of psychratric problems or feel at all uncomfortable about the notion of remembering your birth, we suggest that you check with your doctor before trying any of these exercises. Since focusing on one's birth can generate surprisingly agwerful emotions, we recommend that you take these exercises slowly. Allow yourself plenty of time to fully absorb their impact, and do no more than one or two expresses a day

EXERCISE ONE: AS THE PENDULUM TURNS Your conscious thoughts are often ac-

companied by unconscious, repetitive destures. You may, for instance, nod your bead when you saree with another person or shake your head when you disauree. In the following exercise we tast such "ideomotor responses" to tap the recesses of your unconscious mind, giving you access to hidden birth memories that may reside within. In this case we use a penduli m technique developed by David Cheek, an obstetrician and clinical hypnotist who has found that the tiny muscles in the fingertips move in response to specific thoughts.

Begin by tying a small weight, such as a paper clip, to a thread about eight inches long. Find a quiet place to sit, rest one elbow on a comfortable surface, and hold the thread between your forefinger and thumb, with the weight dangling like a pendulum

Next take a close breath relax and think. Yes, yes, yes, until the pendulum begins swinging or rotating in a particular direction. Then think, No. no. no. and notice how the movement of the pendulum changes: Finally, think, / don't want to asswer over and over again until the pendulum moves in yet another direction. Don't try to consciously influence the movement of the pendulum. Instead just observe its natural motion in response to your thoughts. In this way you'll allow your unconscious mind to directly influence the movement of the nendulum.

Once vou've established distinct directions of movement for viss, no, and /

40 OMNI

don't want to answer hold the nendulum. take a doen breath, and focus on your birth expenence Ask yourself. 'Is my mother awake when I am horn?" Notice the direction in which the pendulum swings as you concentrate on this guestion. If the nendulum swings in the direction for yes, ask yourself. "Is my mother able to say anythrog?"

Now focus your thoughts on the first law moments of your life outside the womb. While continuing to hold the pendutum ask vourself. "Do lifeel welcome?" Then as a final question in this exercise. ston and ask yourself. "Do I feel warm. when I am horn?

Take a few moments to consider the nossible asychological significance of your unconscious responses to each of these questions as indicated by the nendulum's movement. For example, how might the nercention that you felt welcome or upwelcome in the world have influenced your emotional development?

♠Imagine vourself as a developina fetus hecomina larger and heavier

within your mother's body. What impressions do you form of the outside

world based on the sounds you hear?

By using this approach and letting your unconscious be your guide, you can come up with some fascinating insights. You can check them out later to see if your birth memories are accurate. You might, for example, ask your mother if she was drugged during your delivery.

"The doctors in the hospitals-and I was as bad as anybody for yearssometimes drug the mother so she's not able to speak," Cheek explains "The baby, not hearing the mother's voice feels rejected, as if nobody cares. The subsequent feeling of being unwelcome is thus often due not to maternal rejection but to the pature of bosoital care

Another way to check the accuracy of your birth memories. Cheek says is reconsidering whether you felt warm. No beby feels warm immediately after birth. unless the delivery room temperature is 102" or brober Potential benefits: This exercise can

halp you explore the nature of your start in life. Was it positive or deflating? Frightening or calming? The answers can also provide you with insight into your present attitudes relationships and goals.

EXERCISE TWO PICTURE YOUR BIRTH While the nearly it mexercise may help you tan your unconscious thoughts and memories, it won't necessarily stimulate conscious impressions of your birth. The following exercise, suggested by Toronto nsychiatrist Thomas Verny, coauthor of The Secret Life of the Unborn Child, goes a sten further by triggering birth-related mages and sensations

To practice this exercise vou'll need a book of photographs showing the develcomental progress of a fetus at 28 days. 2 months 3 months 4 months and so on, Lennart Nilsson's book A Child Is Born is brobby recommended, though any simlar text showing color photographs of embryonic development will do

Begin by sitting alone in a quiet, comfortable place, somewhere you can later lie down and listen to classical music Relax, and spend at least 20 minutes looking through the photographs in the book. Imagine that you are gazing at images of your own operatal development. and notice the impact this has on your feelings. Stay with your feelings as you controug finning through the nictures and thinking about your expenences as a de-

Then he down, get comfortable, and niav a classical record or tane at least 30 minutes long. Any classical orchestral music will work though Mozart Vivaldi. or Schuhert should be particularly effective. As you listen, focus on your memories of the photographs and on any spontaneous thoughts and images triggered by them. Don't pressure vourself into teeting something. Instead just relax, allow your thoughts to flow with the music. and remember the feelings the photographs inspired. Close your eyes and magine that the music is carrying you back to the womb.

This exercise may not tripger a major. birth memory, though Verny suggests that such an occurrence is entrely possible "Whatever happens is fine," he says. "You might just get a feeling about what it was like to be in the womb, or you may get an image of a color, an image of being born, or a sensation of being a tirry baby swimming in the amniotic fluid

If the exercise is a positive experience. repeat it in about a week. Verny sugcests. Often the images generated by this exercise build on each other, he reports, so that after awhite a more complete picture of your prenatal expenence may start

Potential benefits: This guided-imagery exercise can help you see that even though birth was difficult, you have overcome it. Replaying these mental tapes from an adult perspective can help you overcome other stressful situations.

EXERCISE THREE GO WITH THE FLOW As many psychologists believe there is nothing more comforting than the environment of the womb. The following ex-

PRESCHOOL

and five times, we stimulate neural growth hormone in the brain region for math."

homone in the brain region for math."

Van de Carr concedes that his theory will remain just a theory until laboratory will remain just a theory until laboratory tests are done for by-products of neural growth hormone. But, he points out base who go through the program are born with especially long raiss and sometimes even teeth. Because neural growth hormone is often broken down with other types of growth bornones, he says, this unusuel growth could signify that his the-

Van de Carr says his theory is also borne out by Prenafal University graduates now entering kindisgrafen and first grade. "We're starring to see a lot of these kids." He says. "Many of them test in the nnelly-ninth per

Verny agrees that Van de Carris graduates "seem to enter the world with an enhanced sense of confidence and calm. They are quots adaptive, and socially aware But whether they are actually developing lifetong intellectual capabifities, as Van de Carri befleves, remains to be seen."

The Van de Carr approach may be radical but it seems downtool medieval

compared to the techniques of Brent Locan, a Redmond, Washington, psycholoast. Pushing the outside of the prenatal-stimulation envelope, Logan has recently developed what he calls the cardisc curriculum: a set of increasingly complex and skewed heartbeatlike sounds that he numbs into the womb. By taking the sound of the mother's heartbeat and making it more and more complex, he says, he is actually stimulating the fetal nervous system and even saving large numbers of brain cells from certain death. Children stimulated via his program. Logan clarms, talk at the age of five or strimonths and read at a year and a half. At six months, he adds, these babies are in many ways developmentally equivalent to toddlers of a year and a half.

the fault recklob systain to event several terms that it is a series of the program. Logaric barries, list a fit the agree of the core of smooth series of a year and a self. As a month, in a soft, is the observation of the core of smooth series of a year and a hard. Logaris interest in persuat dimutation dates back to 1862, when he wide, higher barries and or the core of the

had been talked to before birth."
Logan was excited by the concept. But, he wondered, was merely tativing to the letus the best way to proceed? He began to research the issue and, he says, turned up a vital clue. In 1960, he discovered,

the now-lamous psychologist Lee Salk and visited the Central Park Zoo in New York. While watching the rhesus monkeys Salk noted that the females held their offspring over the left breast in the vicinity of the heart. To see whother this was a universal fendancy, Salk studies exveral hundred human mothers at Elm-hurst. Hospital in Queens. His finding? Most mothers, whether left- or right-handed, invariably held the beby on the left, over the heart.

left over the beast.

Wondering about the meaning of the Wondering about the meaning of the beast these things are the beast these things are the beast these things are the season of human nature. To one plots the coverage the coverage that the c

Speculating about the importance of the maternal heartbeat, Salk later suggested that it might form the basis of music and dance—and many other human

activities as well.
After reading the studies, Logan agreed. Allearmy, he told himself, is 'a variation on the single theme—the heart-beat—engraved of lifes start." While the saging, talking, and touching advocated by Verny, Van de Carr, and the Susedities were a step in the right direction. Logan concluded, heartbeatkle sounds would be better eit.

But how should Logan's stimulant hearthealfike pulses created electronically by a sound expert—be administered? To crchestrate his input, Logan considered the development of the brain

catalogical the development of the brain had receitly been shown by reaminating the control of the control of calculations at Los Angeles, Logan frow, with most of the neurons in the mammalisan brain pertint before birth. The scientists had even grange so far as to con the torm protobare, their name for the pranatal brain before neuronal deeth. By stimulating ratis promating, researchess had even managed to recove some of the protobrain, producing superimetic the protobrain. Producing superimetic per reference and the protobrain of the control of the protobrain.

To Logan, the implication was clear. There was a window of opportunity that existed pretitint," Logan rescende. It you didn't greep that opportunity through stimulation, the extra brain cells—the extra human potential—simply want away."

To bestgrasp that potential Logan decided he would expose the total brain to "heartbeet variants"—cardiactive rhytms, that stimulated different neurons from those stimulated by the maternal heartbeat the fetus heard every day Logans incredible goal creating a series of au-



"There are times when I think I want to take oil for the East Coast and sust intellectualize my life away."

diotapes that distorted the heartbeat a little at a time so that normally doorned brain cells could floursh and grow

Toward that end, he founded the Prenatal Institute in Redmond and began designing his tapes. The complete cardiac curriculum, developed in the last couple of years, consists of 36 increasingly complex, hourland tapes. The first tans, played in the middle of pregnancy. starts with the basic rhythm of the maternai pulse, set to the beat of A-A-A-A. It is played twice a day for a week. The next tape renders that pattern with a bit more complexity: AA-AA-AA-AA. It, too is played twice a day for a week. The third tape delivers the beat of A-AA-A-AA, the fourth, the beat of A-AA-AA-A, the tenth, BAB-BAB-BAB BAB, the twelfth, ABC-

CBA.ABC CBA, and so on With his curriculum set. Logar needed a valumeer, someone eager to have his source piped into the worth. Lockly for Logar, the perfect candidate fived nearby Cayle Loyd an exparienced educator, had directed her own preschool, called Kids University, in Washington State for years. Devoted to prenasal education, she had even used than de Carris.

program in her previous pregnancy. An attractive woman with plercing gray eyes, a delicate nose, and a wholesome, enthiusiastic air, Levi had met Logan at a conference in California. They had remaned thends since Fascinated by Logan's research. Loyd encouraged and capided him. And when she became pregnant, he had his volunteer.

Using a Walloman and a headast that she placed around her abdomen. Loyd played Logaris tapes during the houriong commute to and from her job. "I started at the rine-week point, just before the first brain growth spurt," she exhere the played by the properties "The tricky part was trying to find the best decibel level. I finally set the Wallsman within at leicht."

While Loyd monivous about toying with the bulby of his constitution of the land in a work for the constitution of the land in the portion, the says, you should make it as close to return as possible 10 me working with the heartheast separat bost. Frankly, the acids, "my greatest worry was boring the baby if it has been up to me, I would have changed the tapes more often than we did!"

When Loyd's child, Stephen, was born in July 1987, his eyes were wide open. "It was amazing," Loyd says: "Helicolked up and said, What!" Six hours later, when is dicotor examined him, he grabbed the stethicscope I mean, this is hours old!" Strothen is a very special how I open.

Stephen is a vary special boy Logan says. He was sharing toys at six months of age know 50 words at fourteen months, and most impressive staffed to read at eighteen months. What's more, Logan says, Stephen in not alone. Beven subsequent cardiac cumculum graduates have shown similar abilities. At six months of age, Logan says, Logansays, these bebies

demonstrated many abilities not expecied in show up for a year or more. Logan estimates that cardiac curriculum graduaties will in fact demonstrate extraordrany ICe of 150 to 250 and up These "engineered" children, Logan predicts, will aso "orbhite textraordrany gains in creative abilities, interpressional skills, chreatere stability, whieto accom-

phshment, empathy" and more So convinced is Logari that he has even packaged his cardiac curriculum in a new product. Called The Prelearning Program, Logaris 16 "Babytapes" and malernisi speaker belt (to be worn around the wast) retail for \$149.95 through Prelearning Inc.

Until Logan's results are confirmed by independent researchers, of course, the true value of his product remains up in the air Marry of his colleagues, refusing to be quoted, say they are horrhed by such tampering in the womb Lee Salk whose research inspired Lo-

 Children stimulated
 via his program, Logan claims, talk at six months

and read at a year and a half. At six months they are in many ways equivalent

developmentally to evaluen-month-old toddlers.

gan, does not believe his studies validate the cardiac curriculum in any way. "I did my work to observe natural behavior," Salk stays. "I'm very cautious about taking my studies and generalizing to cause."

and effect Thomas Verny calls Logan 'a brilliant guy" but says. "The cardiac curriculum seems awfully complicated for me." Even if the carciac curriculum does work, however. Verny would not advocate it or any system amed at enhancing intellectual achievement. "I do believe that stimulation and communication are important. But I do not believe in prenatal education, nor do I think that parents should want children to become little Beethovens or little Finsteins or whatever their idea of what the perfect person is. Instead, we should use the window into the brain to tell the child that it is wanted and

Even Rene Van de Carr, research director for Logaris institute, has a waitand-see altitude. "I have observed one cardiac curriculum baby and watched it mature over a period of months," Van de Carr says: "We found that in that case,

respiratory rate became modulated to the complex rhythm of the lags. So for whatever it's worth, we do know that the taped sounds are passing through the abdominal wall and that they have had at least some sort of effect. But whather the curriculum is achieving the developmental milestones that Logan suggests needs the benefit of a larner stuty.

- the benefit of a larger study.* Scientists in the field of pro- and pernatal psychology seem more certain about the significance of another area the experience of beth, Indeed, the notion that bith has any lasting impact was did once considered about 5 bit today it is widely believed that the bith experience may profoundly determine who we ultimatily become.

mately become Lee Salk, for instance, writing in the prestigious British journal Lancet, has attributed teenage suicide to the trauma of a difficult delivery. (See Body, November 1988) Comparing the birth records of 52 suicide victims born between 1957 and 1967 with those of 104 controls, he found that the suicides generally tacked early prenatal care had mothers who were chronically ill during pregnancy, and suffered respiratory distress for more than one hour after birth. In a related study, Dr. Bertil Jacobson of Stockholm's Karolinska Institute found a correlation between the kind of birth trauma and the method of suicide. For example, those who asphysiated themselves, whether by hanging, drowning, or gas poisoning, were four times more likely than the controls to have suffered oxygen deficiency at birth. And drug addicts were frequently born in hospitals where doctors often administered opiates, barbiturates, or chloroform to women in fabor

In another fascinating body of research, some psychologists say they have evidence that we literally remember birth. One of the first people to get a peek at what seemed like bona fide birth memories was California obstetrician David B. Cheek. In one of his most impressive studies Cheek showed that people retain a muscle memory of the way their heads, shoulders, and arms moved as they entered the world. "As an obstetrician." Cheek explains. "I knew that when a haby comes out the birth canal, it automatically rotates its head in a particular fashion. I also noticed that whenever I asked my patients about birth, they spontaneously turned their head in a similar way So I got the idea that maybe they were remembering the same physiological mechanism they'd experienced while being born

To check this theory out. Cheek rerured some petients he had delivered decedes before. He asked them to go over their birth, and, after checking his records, he found that "a hundred percent remembered the way their head rotated as it came out of the birth care! Airmost everyone remembered which arm came out first as well."

44 CMNI

Finally, San Diego psychologist David B. Chamberlain has collected what he believes are detailed memories of birth. Chamberiain author of Rabies Remember Birth (Jeremy P Tarcher, Inc., 1988) and one of the seminal figures in the preand perinatal psychology movement still recals the first time he heard a patient describe being born. I was sitting onposite her "he says. "There was a big. beautiful asparagus fern and a buge nicture window behind us, and the sun was shining in. Across the morn was a baby. grand. All of a sudden, my client, a fiftvish woman named Lee, described a visign of her birth. The doctor is holding me up, laughing," she said, "I fold you it would be a cirl be said to Mother Now

Mother is turning her foce away."
Determines to check this outliturine,
Chamberlain conducted a study of tean
mother-differing pairs. Her reports that
while under hyprosis, mothers and offspring alike recailed startingly similar
defails of the offspring's birth. One
diaughter, for missione, our recovery
and the offspring should be allowed to the
mother correctly recalled her mother
melting her, then expressing concern

over the normality of the baby's toes.
Other researchers have discovered a plethora of birth memories pouring forth from the young. Linda Mathison of Seattle has discovered that young children instructed by some experience or associated.

ation, frequently come up with detailed memories of birth. Most of these reports, Mathroon has found, emerge between the arriss of two and there.

ages on two and mines.

One of the most spectacular reports comes from New York psychiatrist Rime. Labow Latbow was giving her young son a bath, she remembers, when he looked up at her and said, "I have some questions should have have new."

"What do you mean?" Lalbow asked "When I was brand new," he replied. And then his questions becan

"He wanted to know where the bottom half of everyone's face was," Labow recalls, "and why there was a bright light over his head, and what the furny notes was He also wanted to know why someone shuck a finner in his anus."

In fact, Lablow says, all these things had occurred. Doctors and nurses were wearing surgical masse, the nose came from suction equipment, and surgical lights were glaining for all to see. "He had a clear perception of chronology," Lasbow says, "and I was shocked when he made a loke."

Labow's son, it turned out, could speak some Yiddish. Turning to her, he said, "There was a finster in the fenster" "That means there was a window in the darkness." Labow explains "My son had here high he need to he certification."

tion was precise.

Now one of the organizers in the grow-

ing field of pre- and perinatal psychology. Latbow is chaming the fields annual congress the morth in Amhorst. Missas-chusetts. The biggest moeting ever of experts in this discipline, the convention is expected to airtist nine from 800 missabiguants and get broad coverage. And there will be a follookecuse. This conference in every annual price at his created new perspectives and ig energied perify of social and secretific obtains.

Many pro-Hers for instance, argue that the research bolders ther content on that abortion is wrong. Most of the scientists con't argine. The new information socies not maken we should lake choice swisy from women, Verry says. "Rathier, in resears we must relevatually subusit from infant anasthesa to sumopate motherheod. We must study the impact we are heod. We must study the impact we are.

having on those who are ultimately horn. One thing that bothers Verny, for instance is the peopatal intensive care unit (NICLE in which habies are broked in to machines, exposed to "more sound than you would hear on Fifth Avenue at rush hour," and flooded with light, "Not long ago," Verny says, "I met a pediatrican from Seattle who told me the story of a sick NICLI haby. The child was just not getting enough oxygen, and he was turning blue. The doctor decided the baby was going to die anyway, so he took the baby off life-support systems, shut off all the machines, and turned off the lights. Then he took the baby out of the crib and rocked him in his arms. Within a few minutes the baby furned pink, and his recovery was complete.

Verry is not supposting that we banish the NICU Rather: he says, we should create an NICU that is "more ideal." We should out down on the light, the note, the blood balling. We should start with the premise that the critically ill newborn needs calm and quet, just like the critically rit author.

For the most part this point of view sits well with doctors running NICLIs. "We all feel the environment is not ideal," says negnatologist lan Holzman, chief of the division of newborn medicine at Mount Sinai Medical Center in New York City. When babies are not critical, we make every effort to reduce stimuli like noise. But we must shill balance a more perfect atmosphere with our medical and legal constraints. We must observe and monitor the babies. If the lights were turned down low in the critical-care area, if would he difficult for nersonnel to see that a baby had turned blue. When we send these habies home, we tell parents about the excess stimulation and the unusual

biothythmis we may have induced."

Verny would also like to see the birth expenience rendered more personal and less high fech. "It believe in medical intervention only when it's really necessary," he says. "We need mother's advocates, hospital birthing rooms, and obstetriciams who catch balves insteam."



of extricating them by force."

if pre- and perinsial psychologists question modern science, modern scence is still evaluating them. Lee Saik, scheduled to be keynote speaker at this modern science and perinsial psychology are "certainly interesting and need to be exclosed."

New Jersey clinical psychologist Arry, Altenhaus adds that some of the techriques and findings of pre- and perinatal psychologists may be beneficial. For instance, she says, "such hings as musc and massage, if they calm the mother down, can only be positive for the fetus."

Altenhaus, a long-time expert on woman's health issues. believes, however. claims regarding ICI and other intellectual abilities may be premature "It is often difficult to predict behave or from developmental milestones before the age of three Asix monthold who achieves exceptional develcoment may not necessarify he excertional down the mad Only later on as the child gets older is there

"Beyond that, parents who stimulate their babies prenatally are probably stimulating them more after birth as well. How do you tesse out the factors responsible for the ob-

much stability to

Even if we could determine for sure that prenatal stimulation enhances 10,

adds Altenhaus, "the drive to have a brighter child may, in the long run, do more harm than good. The pressure to be so exceptional could turn the child into the equivalent of a burned-out broker on Wall Street by the first grade. We need some perspective. There's so much to learn about the world why toous on.

reading percentifies or IOP* Anthony DeCasper, the North Carolina professor applituded for his pioneering decoveries about the sensory capabilities of readoner, has other problems with the research. "My work shows that human fotuses do have some sensory experiences," DeCasper says. "But in terms of the disk in, the divestigemental significance of these experiences is unclear. As an experimental psychologist, I am skeptical of claims that you can make healther, happer, more nitelligent babies through extraormal sensory stimulation Despire all the anecodies. I know of no scientifically acceptable evidence show-

ing this is so."

BeCasger also has reason to suspect that some of the more extreme forms of prenafal stimulation, especially those relying on special bets to pump source lying on special bets to pump source groups the fact that sensory systems in the fetus are functioning. The says, they are still immediate. These systems

arcose is unclear vicebolistics and control of movement was described; you can make rehitiger babies per Cifford Gootstein author of Scenos and the Libroron masts that we cannot story defination of the Libroron shows the company of the format fellow in the same way we study a detecting impact or oil. The same way seem to suspect on the Libroron street was the control to the control of the cont

main lease, when sale and uninstant, is sometimes called for "Grobetein says. "For instance, infrauterine surgery may ometimes save a behy's life. Experimenting with a developing human fetus, however even in hopes of some greater good sometime up the road, is always situated home quiestine.

Despite such questions, the new field of pre- and permatal psychology is sure to change the way we treat the father

> Thomas Verny when newborn children are toulinely treated with gentieness, respect for their human. ity, and love. And Rene Van de Carr believes that by born, we will awaken many lost his man traite "Ay stim. ulating the brain before its plastic. rty shuts down." Van de Carr savs we might be able to oraduce children capable of enioving many subtle. things from all the

and the newtorn.

nuances of flavor and scent to incredible flashes of insight to fast-moving visual cues." At the outer edge of the field, Brent Logan predires that presented.

edge of the field, Brent Logan predicts that prespens women will one day weer tiny transators choosed to clothing near their

reproduce an assistance version of the cardiac curriculum, he declares: stimulating the feat, every day. This technology will be the aliantiel securice for the original control of the control of the control of the in how and when we learn. The impact in the Tiera Wardi. Very amony, when you could be exposedly profound. He adds, in the Tiera Wardi. Very amony, when you for the control of the control of the formar, you hand out a crimental stimulator as well. When the woman is pregnant, the just city is on the a stateman. And me months talker out convex a restoration ministrict human intellect and behavior ministric human intellect and behavior.

around the world DO



somen will one day wear tray modally influences another and overstimulating one system before it is ready reproduce an advanced version of the could image reservor or reproduce an advanced version of the could image reservor or reproduce an advanced version of the could image reservor or reproduce an advanced version of the could image reservor or reproduce an advanced version of the could reproduce and the could reproduce an advanced version of the

functioning as a whole

DeCasper takes particular issue with systems such as the cardiac curriculum, which claim to work by saving brain ceils from death. *Not only is brain cell death a normal part of development.* De-Casper says, *It is also ossenial. Thirk of the brain as a statue. At one thins the substitute was use a popoc of marble. As the couptor takes bits of the marble away, statistic was used as popoc of marble. As the couptor takes bits of the marble away, is the same. Perseach with developing chicks, in fact, showed that when neutros were prevented from diving, neuron-



FICTION

BY MICHAEL BISHOP

takyushu, staying clear of the vacant houses the wrecked machines, and treat, Makoto coaxed an island. Scooping meat the surf for fingerlings from the carcasses, these and crab. He traded this devolved beings fright- man a rosary of spent

Once beyond a time, ened Makoto—as did all Makoto Asaeda the disconnected, ragjourneyed south tag people on blind to escape the Cata-horses and larne oxen, clysm Hehikedout of Kir hundreds of refugees

the ruby-eyed beasts abandoned tank more aprowl in the denuded than two hundred kiloforests. He also avoided meters. At last it stalled on the human savages a spit of sand, and he hunched over the dead emerged to see a halfdray animals littering the naked fisherman seining

PAINTING BY HEATHER COOPER

cartridge shells for a dinghy voyage into the East China Sea, an obstacle course of mines and listing vessels. Shipboard, Makoto diept for the first time in weeks—but his dreams fretted him, for his had no guarantee that any sort of improvement awaited him to the south.

As it happened, Makete sailed for weeks, periodically switching vessels and bartering passage all the way to the Sakishima Islands, the Philippines, and the Celebes Sea. Finally, after disembarking among the rocks on a forbiddingly fropical share he killed a coney for dinner and continued hiking southward. On this new island-or was it a peninsula, the fat nose of a flooded continent?--Makete encountered fower refugees, so many fewer that he began to regard himself as one of the last human beings alive. Trudging through a stripped jungle of bloated orchids and shrapnel-blasted trees, he found that this idea, even if false, gave him a shiver of dreadful self-importance. It also profoundly frightened him.

Three days, of three funded, passed Makolo, ballanded on the edge of a marshy tabletop, gazed down hinds an immesso crater full of decapitated cyprosess and ragged refuges birts. At 15 and 15

How could anyone repudiate hope when such a lovely monument to human creathyty had outlasted the Catacitysm? Instuctably, the lathcework palace clrew the fraveler down to it. Outside its gate,

the traveler down to it. Outside its gate, Makoto encountered a band of people knocking for entrance. Clad in frayed derims, rubber-brogged snacks, and tedyed headbands, some were locals, and tedyed headbands, some were locals, and for these left Makoto know that they had journeyed farther than he had. This structure—the tinuse of Aborting Calm armwidth of the Transfelund. Computer Web, it progressed assentive.

Butterflies of every sort, they told Makoto, floeled in the conservatory, and the Lady Yoko Kamiko was attempting to read their siks in order to rempose order on the prevailing chaos.

Dreamers, Maixotomentally castigated them, certain that nothing could counteract the run intificated by the skirmishis, looting, and perny-and wars following the shorelline floods and the collapse of TransMunch.

Clearly, he reflected, "reading the sits"—studying and their interpreting the exquisitely patterned wings of butterflies and moths—was the least workable of all such flighty enswers to the nightmare of the Catachysm. These people at the gate his malls for sanctiarry, were crazy. Or

into else the Lady Yoko and her hirelings had urse royally hoodwinked them.

"She's a living saint," a devout woman assured him. "She'd let everyone in if so many visitors in the flight chambers werent a hindrance to her work."

werent a hindrance to her work?
"Pas on that'll cred a skirnty while man from whose yin-yang headdard have hereby cap of an earney and the rusty caps of some American soft the rust of the put entire and the gate of the butterfly house—that she less only a few of us in at a time and, even then, just long enough to tarking ust long the ust long to tarking ust long the use of the use of

just long enough to fantalize us.

Others chastised this gayly for ingratitude, and Makoto noted that some of these people were holding boxes or kerchiefs that they proudly showed around. In their boxes and kerchels (siv the ou-

chiefs that they proudly showed around.
In their boxes and kerchiefs lay the pupe or caterpillars of mmature lepidoptera. Only petitioners who had brought such gifts were allowed to enter Lady Yo-

ko's house, therefore, Makoto fraded a con that his father had once given him for a small box containing a fuffed gypsymoth larva. The negotiating was hard, but once he

had persuaded the woman with the queer little caterpillar to yield it, he knew that he had decided correctly. When the handicapped gatekeeper finally allowed six petitioners to enter,

nally allowed six petitioners to enter, Makoto was among them "You have a single hour" said the gate-

keeper, a quadriplegic plugged bodily into a three-wheeled chair. He took their gifts and smugly passed them through, "After that," he cautioned "you must return to this room and exit with

your fellows " sent, though! Makozo, but another part of his mind rejoined, Widoh! Nevertheless, he used the first portion of his hour to walk through a barnstorming Royal Ar-Force of British orange tips, four of which

Il landed—weightlessly—on his clothing of Makoto also used this hour to dodge is the languid acrobatics of a pair of grant or Atjas moths, creatures doomed to mate

and die because they had neither guts nortongues.

not tongues. He heard the eene fluongs of a tiger moth with timbal organs on either side of its metathorax. He wasched a Palamedes swallowfall settle on a dwarf magnotia near a recycling waterfall, he marveled as an emeratichanded swallowfall looped-looped him fike a delicate leaf striped.

with an emulsion of verdigits "Mearly at six is obtained from the six-Mearly at six is obtained from the sixment, Burbayx mon", spoked the qualityregion to some of the other visitors, escorting them to the gale. "Six such as sharnung and hassah are the products of vancus. Astalet Saturnidad" "He kept up this blather even as he gyroscoped this way and that, distrustribly searching for

stragglers. Makiotin remembored seeing a Innanclad worker in the chember in which the Aligs moths had danced. Ducking out of the gatekeeper's sight. The furmed there to plead with this woman't oracle clothes with Im—her unese jumped. For the with Im—her unese jumped. For the surprise, sho end do for the future in the House of Abdring Calm fatigued and bored hes.

"The Lady Yoko," she said, "is so involved with her rejection of meaninglessness that she and Barnie"—the gatekeeper, apparently—"driver us like oxen." And so this woman escaped with Makoto's group while he crouched beneath a wooden bridge in a chamber crowded with fullo trees.

After the coastal floods and the TransMand computer crash, the Marian TransMand computer crash, the Marian for a time Marian transmitted. Once betion a time Marian transmitted transmitted transmitted transmitted to the Marian transmitted transmitted which were the marian transmitted transmitted which were transmitted to the Marian for the Marian transmitted presentation of the Marian transmitted transmitted properties of the Marian transmitted properties of the Marian properties of the Marian properties of the Marian properties of the properties of the properties of the properties of the Marian Marian

Biological weapons had contributed, as had 'weather control,' corp-strangling chemicals, guernilla-launched concussion bombs, and a battery of other non-nuclear options. It wasn't said, Maktoo thought. It was stuped Maddering He regretted his own bemused part in the early rioling and folling.

Someon's had chopped a rotten mango from the bridge. Along with the putrelying pears and bananas in nearby chambers, the mango was meant as food for some of the leptophera. In fact, all poyant moth was already lapping into the beart four.

But what seized Makoro's attention was the severed spiderwob in the lower branches of the fullip time through which the mango had ripped. The spider from the web dangled free, struggling to rappel back up into its polygonal heart. One strand waved fortion hi nan edidy from





the sleek black nelage of the night. Mekoto emerged from beneath the bridge to marvel at them through the glass roof Too had be had no one to share their beauty. He would have welcomed even Barrier, the imperious cripple who hard taken his larval offering and let him in However he had only the butterfles none of which flew at riight Head back, Maketo swallowed the sky

thankful that guerrillas had spered the House of Abiding Calm. Had a simple respect for the wonder it conserved dissuaded them? A mysterious regard for the Lady Yoko?

No matter. The house had its own power supply water sources, and temperature-regulating units. It was a selfcontained cosmos, and Makoto was lucky to be there He fell asleep in a bank of purple thrift.

When he awoke, Lady Yokowas kneeting, heside him in an infoscent kimono. Ramer, in his motorized chair, gazed down from a face like a fin colander wranned in flesh-toned rubber.

A heav sun hart replaced the stars, and the liquorish stench of decaying fruit permeated Makoto's new clothes. Startled he sat up so quickly that the dour quadriplegic laughed. 52 OMN

"Jumpsut aside" noted Lady Yoko, "you don't much resemble our disloyal Triph *

They allowed him to stay because Trinh method of extending his soloum did not endear him to Banier What nersuaried Lady Yoko, however, was the obvious fact that Makoto had living gray matter be-Once before a fime, he truthfully told

her, he had troubleshot the cybernetic pincers on an undersea harvester engineered and built by a company in Kitakyushu. But that employment had washed away along with the TransMundi Computer Web and all the mutually dependent apparatuses of civilization-at-large.

Maketo had barely escaped the continuing Reaction Riots without making a few involuntery blood donations. For that reason, and that reason only, he had murdered two children-one of them armed with a battered Uzi-and then cone on to search and despoil the flooddamaged, paper-walled house of his young victims.

"Please forget all that" Lady Yoko said "I have need of you, Mr. Asaeda."

Mekato passed his days running computer simulations of the file cycles of metalmarks, hairstreaks, checkerspots, noctuids. When he had finished the runs already picted by Lady Yoko, he was

asked to do food-supply predictions. habitat-improvement calculations, and a lovely evolutionary simulation that when screened, burned halos into his retinas. Makoto learned that the Butterfly Effect had to do not with butterflies (or not

only with them), but instead with the minute structure in a seemingly chaotic flow of data. And yet he wasn't doing the work that the people at the gates had told him about. He wasn't--as was the enigmatic Lady Yoko, his employer and patroness

- reading the siks: Unlike most butterfly conservatories. the House of Abrillian Calm had several different chambers, chambers designed for the needs of many different species Makoto learned the dimensions, temperature settings, and humidity levels of each room. He grew accustomed to the cathedral whir of stainers-class wings as monarchs wheeled in squadrons after warming their silks in the pale heat of a mackerel-eved sun. He got used to the bourbonish rot of the fruits that the butterflies liked. He habituated himself to helping Ranier, whose surfiness only increased. Never though, did he accustom himself to the sudden appearances and the even switter vanishings of Lady Yoko, the premier monarch of the house The conservatory crowned a polygonal underchamber in which were located its off-web computers and the guts of its

control systems. Maketo direct like to ondown into this mazelike region because it reminded him of the bunkers held lived. in during the first days of the Cataclysm—but his duties required it, making him glad for any chance to go upstairs. even if only to help Ranier

One morning, when Lady Yoko's factotum seemed especially surly. Makoto said. "Suppose I turned your chair over Barier wheeled back and regarded

Makoto as if he had uttered a great inanity. "It can't be upset its autostabilizers wouldn't allow it. Besides, I'm a part of this chair It and I are' - he searched for a word-"symbionis "Why do you treat me like an enemy.

"Because we're rivals. The Lady Yoko's love is mine-by notif of precedence."

Above the chamber of monarch butterflies reposed the office and bedroom. of Panier's cruel mistress. Makoto first saw this sanctum about three months after his arrival it shocked him to find that its floor was transparent from the upper side, so that he and Lady Yoko seemed to be sus pended in a polarized limbo thirty feet above a milkweed forest ornamented by orange and black siles Awe Dizziness An irresistible urge to

grab for support

But Lady Yoko turned him to the white walls of her work snace upon which were silk-screened in large decorative ovals the scaled fore, and hind winds of countless. kinds of legidoptora

Here, then, she read the siks-after generating their images on her computers' screens and transferring them by a sophisticated electronic process to scrolls of expensive shantung What messages did she harvest from

the metallic patterns of the wing scales? What meanings from the whorls, the pea chamber a butterfly the size of an owl and cock eyes, the opalescent streaks, the ginting herringbone wimples of her babies' magnified wings? Maketo rapt stared at the siks in mingled awe and consternation

"I see in these scale patterns a link between the animate world of earthly inspcts-under the Eve of Heaven a tiny but beautiful, life form-and the macrocosm of the universe." Lady Yoko said. "In the randomly generated beauty of my charges, Makoto I also discern a telling mmor of the planets, stars, and galaxies doing timeless minuets through the farthest reaches of outer space."

Hearing this odd speech, and agonizing to make it parse. Maketo realized that either Lady Yoko was mad or else she had uncovered an entomological Unim and Thummim previously unknown to hu manity After equating the underwing valiation of Orathoptera orienus with the structure of a solar system thousands of light-years away, and the previawn skittishness at her fritilanes with some unusual meteorite activity near Juniter Lady Yoko took Makoto to her bed. Here she

Makoto meanwhile squaht not only to acquithimself well but to calm his pound. ing heart. He never quieted his heart. north because he felt tested and north because in Lady Yoko's darkened bedthe color of greased gunmetal hung above their exertions like a disapproving angel The kaleidoscopic shadows strobing from its wings presaged—in Makoto's mind—the death of an inhabrted world in another galaxy.

Repeatedly, thereafter, Lady Yoko had Makete lie with her in different snots throughout the house Over time, his rejuctance to yield to tally to her eroded.

The woman, if mad, was mad in a way defining connections, not divisions, among anmate and insensate phenomena. Also, without becoming transparent to him. Lady Yoko had begun to reveal aspects of her character worthy of symnathy of admiration, maybe even of love She told Makolo of the psychological

frailties of her father, the quirks of tem-

perament that had kept her mother and her all opgotheads, the somersaut of falls that had transformed her from a pollitics-weary diplomat in Kuala Lumpur into the Empress of the House of Adding Calmered the House of Adding Calmered general flowers the Mekoto himself, she seemed ignorari of the Island, perinsula, contitient, or faller fluors reas on which its

deed burklers had erected if Grapping ceased, borns filled lovemaking began. They coupled on tetraces, feathered by squadrons of Day (Glor ange revolves. They interfaced beneath a tulp tree neer the Onerval bridge. Bribart scarce on William Wings hymned ther merriage. They winsprend—Lady Yoko in term. Making to the create they dided.

to him, Makolo to her—as they glided, buoyant scull on shantung water Always, moths and butterfiles surrounded them with murmungs hosannas.

of flash coloration
Brailly, Ramer disengaged, The quadnjegic molored away from Makoto every
time he saw him coming. When work or
socident forced the five logether, Raminr
was slawshly pleasant, as if learnt that
Makoto's new role as lover gave him the
authority to send him into the fetch wastes
created his this. Calactivam and the Recreated his this. Calactivam and the Re-

action Riots
Belatedly realizing the depth of Raner's burt, Makoto started to worry about how flagrant his and Lady Yoko's bouts of lovernaking had been, and attll were. After telling his mistress that the gatekeeper felt for her an unrequited passion, Makoto was sturmed, and then appated, to learn that, she hadn't known. Whereupon, gulfi-ridden, Lady. Yoko decreed that from now on they must conceal

upon, guilt-ridden, Lady Yoko decreed that from now on they must conceal their trysts.

Phantom of the Opera melodrama

thought Makoto, making love to Lady Yoko in a chamber housing a population of death's-head moths—for the smell of rotting fruits had an aphrodistic effect on hem, and it was impossible, thus seized, to abstein from devouring each other.

them and it was impossible, thus setzed, to abstean from devouring each other Obsession, reflected. Maketo. Soul's attraction to soul told through rampant physicality. Maybe they weren't good people, but they were exemplary, it driven lovars.

Only days later, the quadriplegic Nt back—by throking Makoto into theil same

chamber with a tale about dying deathsheads: They needed tending. As soon as Makoto was in, though, Ramer triggered the bolts on the chamber's door panels. Makoto was stranded there, alone but for the wetrdly agitated moths. What did Ramer plan to do? Re-

lease a hissing poson into the half so that he was drugged unconscious? Makkob heard something—a faint but strictulent chirping. It grew louder, louder and louder and louder. Listering to It. Maksob understood that Ramer had miked.

Now his adversary was incrementally powering up the volume, so that the papery rattle of the death's head moths would first annoy, and then pain, and next deaten, and finally madden him

deelen, and linally madden him. In the early evening's white sky, a giblous moon wobbled like a deflated soccer ball. Makoto, holding his hands to his ears and reflexively grinding his molars, was looking up through the roof of the

was pooring by minought he food in the conservatory. Suddenly, the moon exploided, it repeatedly exploided. Mekoto could hear nothing but the emphasic rattling of the moths, a rising dione that made a continuous backforp to the strent destruction of Earth's natural satellite. Chunks of buper mans movinted outweet, leaping mino-

rivisibility as the night sky engulfed them Proscribed laser weaponry, Makoto mused, A hangover hiccup of stolen "de-

ferse" technologies.
Although the death's-head moths around him stopped chirping, their wings went crazy, the air was a catachysmic blur. Lady Yoko, summoned by the moon's death, appeared outside the chambor,

death, appeared outside the chamber, saw her lover among the franto moths, bemusedly released him Maketo told Lady Yoko nothing of Ranier's attempt on his fle—or, at least, on his santy. He allowed her to suppose that his own carelessness had led to his impresentant. The moon. He much of the

earth, was ruined, so thoroughly blasted that it had jagged satelfites of its own, orbiting fragments whose albidos ingothe mastectomized moon like necklaces of chipped peart. Gwen that ortactrophic Pamer's attack

hardly seemed worth fretting.
The weather changed.
Bains thrummed down like dissolving.

pebbles
According to a visitor from Kampuchea, the seas were slouching inland. Tike

hungry sharks on legs."

"Ramor was a sailor on a peacekeeping ship stung by a missile between Grand Cayman and Swan Island over

ing ship stung by a missile between Grand Caymen and Swan Island over thirty-five years ago," Lady Yoko told Makoto "That old? A man well into his fittes?" Lady Yoko allowed this deduction to

stand "Pamer came apart in the attack like a modular doll. His rescuers flew him in get-cushioned cotops all the way to Melbourne—where, in those days, a team of laser surgeons had won acclaim putting rich Humpty-Dumptres back tonether anain".

Ramier's life, Makoto realized, was something of a miracle, for had never been inch and his wounds had been seyer. The UN organization charged with his pessokkeeping mission had cleared the way for Ramer's surgery, then paid his bits. Today, however, the UN no longer existed, super-eaded years also by TransMundt and more recently by Ghase. Amerit from weather changes and life life.

The state of the s

vivid matitime necklacing of the planet, the shattering of the moon-where. Makoto recalled, at least three nations had run primitive bases-had no great impact on activities in the house it had saved his life (or, at least, his sanity), but otherwise the daily business of caretaking the fragile legidoptera went on as it always had

What an irony.

People had died, and were still dving. because of the moon's unexpected chain of eruptions, which, in turn, had led Lady Yoko to rescue Makoto from Banier, Now. though, the moon's death, and the deaths of all those affected by it, weighed less

of a single leatwing or swallowtall Ten days, or twenty-one, went by Makoto began to forget about how humanity had impovershed the moht

They live ten to twenty-one days" said Lady Yoko "Seldom longer In the chamber sheltering apottos, peacocks, painted ladies, brimstones. and mourning closks. Makoto had be-

ours to recognize individuals. It but when

In fact, during their lovernaking marathons, he and Lady Yoko had to squeeze from their minds the dismaving knowledge that the beautiful creatures were dying even as they protracted their own pleasure. Donning their clothes after one

such tryst, the lovers looked up to see Ranier's chair launch itself from a catwalk

bigh above the skylights. It hurtled off the ramp, hung suspended for a moment, plunged through the glass (thunderheads billowing behind if the monstrous, dirty parachutes). and timbled so dreamly that Makoto could make out every detail of Ramer's emotionless face.

Shards of glass fell with him, a ditter-

Makoto thought that a man plunging

from the moon could not have plummeted longer than did Ranier, who, after impact repostedly somersaulted Dktwand through banks of verbenalike a combine. He was so snugly jacked into his chair that its plugs and connectors declined to release him. Meanwhile, a multitude of butterflies spiraled upward into the transfigured sky

A day later, having struggled to free Ranier from the chair, they dressed him in a silken shirt patterned with tropical ferns, palm fronds, poinsettias, and orchids. Then they set him in his battered. chair again and but his chair in a chamber with unbroken skylights. Soon the Polynesian shirt began to draw butterfles, as did the suely-sweet beginnings

of the decay process This is exactly how I want my own funeral to he" Lady Yolo said. "Promise me. Makoto1

Although he considered it unlikely that he would outlive her. Makoto promised

'One bright butterfly fluttering in an autumn wind can perturb the motion of distant galaxies." Lady Yoko told him a few evenings later in her loftly office. She was reading silk screens, imputing to the designs in the wings of her charges pregnant correspondences to the appearances of gas clouds, black holes, guasar radiation, and newly forming galaxes. Makoto gave her a dull nod extra work he was doing had sapped his strength. Nor could be shake the belief that Ranier's mummifying body set estrice

his shoulders. "Look here!" Lady Yoko blurted. Pointing out the novalike eyespots on the silkscreened wings of a tropical bird wing. she declared that they had flared into existence only since Ramer's spectacular

'A cataclysm unlike anything we have over experienced is taking place out there," she said, gesturing skyward, beyond the orbiting debris of the moon

"Explosions in great stellar chains Many civilizations-not just those centered on a single planet-are dying. The indifferent engines of star formation and destruction have doomed them, and there's nothing we can do' Lady Yoko added that these events

were occurring simultaneously with the mutations of the patterns on her sikscreened wings. As a result, the light from the exploding sister galaxies symbolized by the eyespots on this New Gunea bird wing would not reach Earth for thousands of millions of years

That disaster was too far away to mourn, even if Makoto decided to beleve in it. The loss of the bases on the moon had precedence over Lady Yoko's connectural evesors trapedy-just as did Ramer's suicide and the lingering effects of the earthly Cataclysm that had driven Makoto from his home island of Kvushu.

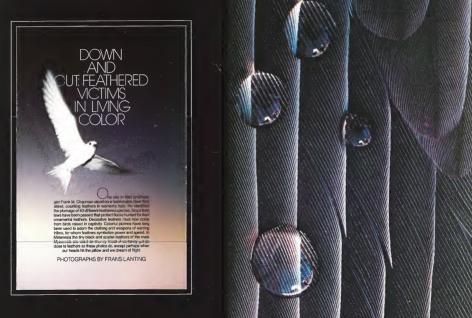
I can only hold so much, Makoto thought I can only embrace so many corpses at once it was better to embrace the living, even if their warmth was fleeting and their defining spirit as hard to hold as the incheate plasmas drifting between the suns

Lady Yoko turning from her silks, intured his confusion. She led him, bewildered by such concern into her bedchamber There, a moth the size of an owl flut-

tered above their embrace less in judoment than in blessing. Makoto and his lady made love, made love, made love, and the silks that came to cocoon them seemed proof against both decay and decipherment DO Michael Rishop lives in Ping Mountain, Geor

Award for short fiction. His most recent novels are Unicorn Mountain and The Secret As-









hours, however, the cells no longer responded to the drug. That suggests, despite what ganja smokers might say, that it takes increasingly large doses to get the same buzz.

Bits Martin, a cannabinoid researcher at the Medical College of Virginia, tested the Pfizer cannabinoids on a variety of animals to see if alterations in cAMP production were related to painfelling power alone or to the panoply of behavioral effects that make up a THC high. "It looks as though the structure of the compounds might be correlated with other

hehavioral effects besides analgesia. Martin says carefully. In the words of another researcher. "Probably we've seen people at parties who were like these anmals: out to lunch."

If the investigators could prevent THC effects by stopping up the cell receptor sites, they would be able to prove conclusively that the binding of cannabi-

noids to cell membranes causes the high "We need an antagonist," Martin explains. (An antagonist is a chemical key that fits into the same receptor lock as the drug but will not trigger the same response-in this case, getting stoned.) Antagonists could provide a power tool for drug research: By selectively blocking some, but not all, cannabinoid et

fects, they could help scientists tease anart THC's complex activities Antagonists and analogs might also have therangutic value. Scientists might discover more refined versions of the cannabinoid compounds now being used to treat glaucoma and decrease nausea during chemotherapy. The compounds could be used for brain research as well 'It has been noted in people who use marijuana that they can't remember later things they learned while high," says Howlett. "You see something similar in the dementia of aging or the first stages of Alzheimer's." THC analogs, she speculates, might be used as a model for studying what hannens in Alzheimer's And an antagonist might help freat the disease. "We also could learn more about pain mechanisms and pathways," she continues "This receptor suggests that opioids are not the only drugs involved in

response in the central pervous system." Miles Herkenham of the National Institute of Mental Health has used autoradiography-a technique allowing precise location of binding sites-to map the distribution of the Pfizer analogs in the brain. Noting the arrangement of binding sites in areas associated with movement. he wonders if THC analogs and antagonists can relieve symptoms of movement disorders such as Parkinson's disease and Huntington's chorea.

the regulation and processing of the pain.

If THC analogs or antagonists prove to

have therapeutic properties, it will be because they mimic or block the action of natural endogenous substances that use these pathways. Howlett's next project is to look for the brain chemical that normally binds to the cannabinoid receptor. She has ruled out all known neurotransmitters. Scientists presume these recep-

tors did not evolve so that animals could get stoned. "There must be some kind of neuronal nathway in the brain that developed whether there were cannobis plants

or not," she says We looked at hormones, steroids, glucocorticoids, peptides, and found nothingleise that would bind to the site," notes. Howlett, who found the same response in chickens, turtles, frogs, and trout "Cannabinoid binding sites in their brains were nearly as dense as in later-evolved

mammals. We even found some in fruit flies" in rats Howlett found the highest density of cannatymoid recentors in the cortex and hippocampus (areas of the brain associated with memory, perception, and cognition) and in the cerebellum and striatum (both areas associated with movement).

Miles Herkenham found that the pattern of distribution Howlett saw in rats also characterized the human brain. The receptor sites were densest in the hippocampus, cerebral cortex, and areas of the carehelium. "What really struck me." he says "was the front-brain loading. It's sort of a high-brow receptor." Herkenham was also impressed by the sheer quantity of receptors. "The binding sites are incredibly numerous compared with other neurotransmitter systems," he says, "which

suggests they are receptors for an important, ubiquitous transmitter Unraveling the mystery of this ubiquitous not transmitter will help us understand how humans and other vertebrates manage the extraordinary juggling act of lwing. The chemistry of reefer madness will give us another way to look inside the hungry, horny, drowsy, excitable glad. anxious, musing, giggly, cogitating, per-fectly sober brain DO

CREDITS

SPACE

camera, coordination. The company had developed one precision system able to nerform the delicate task of lifting contact lenses out of plastic molds. Another system, dexterous enough to pick up vials from a conveyor belt, was accurate to within one thousandth of an inch.

While such specialized expertise had obvious importance in the design of the FTS. Honeyhee had to sweat through a year of faise starts, late-night brainstorming, and paperwork before winning NASA selection last March. "When the phone call finally came, we were hanging by our collective funernals." Gorgvan recalls And the first thing the Marfin Manetta guy says is, 'How's the weather?' So I said to

him. You tell me." The weather furned out to be fine for Honeybee. The group cracked open bottles of champagne and launched into a noisy celebration—the sort of late-night affair that goes entirely unnoticed in the din of the downtown scene

After the party was over, however, the challenge of solving myriad FTS engineering problems remained. To function properly in space the FTS must work in zero g and in conditions that fluctuatesometimes every 45 minutes-between extremes of brightness, darkness, heat, and cold. Thus Martin Marietta will test the robot for tolerance to thermal fluctuaflors and vibration, as well as overall performance. The hands will be tested by codesigner and builder Ford Aerospace Moreover, to meet the rigorous NASA requirements applied to any piece of "space-qualified" hardware, the FTS must be what is called two-fault tolerant. It must have three backup systems for key operations, so that even if two fail, the robot will still be able to function

Although this may make it sound as if sinance is an even rougher neighborhood than the ones in downtown Manhattan, in reality, says Gorevan, "building in space is actually highly conducive to the use of robots because the environment is so highly structured. The myth about robots-that they can be some sort of household before--is actually much more difficult to realize because most households are unstructured."

If the schedule holds and the engineers finish their designs as planned, a fully operational FTS will take a fest vovage aboard a shuttle flight in 1991

The skyscrapers of Manhattan and the great bridges at her outer edges bear mute testimony to the construction challenges of a bygone century, a romantic link between past and future not lost on Gorevan. "The space station is the Brooklyn Bridge project of this century he says. "It is a great, unprecedented construction engineering feat with longterm implications for the future "DO



This guy ran up to the helicopter and he had thermal burns on his face from having gotten too close to erupting lava.9



his plans and Jules Verne's novel Journey to the Center of the Earth. "Verne's story is stupid," says the concept director for Reunion's small volcano museum. which will open next summer and for a science center at the foot of the extinct, 600-meter Puy de Dôme in central France. Visitors to the Puy de Dôme project, exnected to take five years to complete, will rido a class elevator into the volcano to view inner Earth. The experience will also include a simulated equation. "I'm a serious volcanologist" says Krafft, whose own inumey in a lave flow would be the fulfillment of a childhood dream as well as a daring-some might say foolhardy-scientific experiment. "We'll measure the gases and temperature among other things, from one end of the flow to the other. something that has never been done"

Krafft proposes that a helicopter drop his capsule into the lava. At the end of the flow the air crew will lower a cable Michigan Technological University volcanologist Bill Rose and colleagues (above) study El Chichon, Monon's 7,300-foot-birth volcano, which crupted in 1982, spewing hot nas, rocks, and ash into the atmosphere and killing more than 2,000 people

with a hook on the end, latch it onto the capsule, and carry the capsule away to safety. If the aircraft crew can't catch the lava capsule. Krafft adds, there will be an escane hatch in the vehicle so he and his tellow passenger can get out and hook the cable onto the capsule themselves The cone-shaped, enclosed lava craft

will be coated with titanium oxide to protect it from the lava's high temperature. which reaches nearly 2200° F. The inside of the cansule will be tried. Ike the exterior of the space shuttle, with heat-refracting material. "And the heat that's not deflected can be used to refrigerate the interior." Krafft says. Then, in a sudden burst of laughter, he adds, "Maybe I'll be frozen in there! Just imagine the headlines: VOLCANOLOGIST FREEZES TO DEATH IN A LAVA FLOW

At the Hawaiian Volcano Observatory (HVO) on the "Big Island" of Hawaii, seismologist Carl Johnson and computer specialist Tom English chuckle at the mention of Krafft's plan to navigate a lava river. "He'd incinerate." Johnson says, tongue in cheek. 'And even if he didn't, his corneas would fuse and he wouldn't be able to see anything. The human animal isn't designed for that kind of environment " English counters that "he could do it for a fraction of a second and have a heliuva time. But I'm sure he's kidding. The two men look at each other and orin. They both know Krafft and realize

he might indeed be serious Few volcanologists, of course, are likely to book a seat in Krafft's craft "He takes more risks than I ever would," says HVD head scienfist Torn Wright Like other volcanologists studying the geology of volcannes from concention to extinction Wright works in the field with active and even arunting volcanges. But these researchers also use computer programs, tomography infrared photography, remote sensing, and other technological tools to study volcances. Indeed, HVO scientists have developed and refined most of the techniques employed by volcann observatories around the world

Strll, volcanology attracts its share of risk takers and thrill seekers, as well as the occasional wacko, admits volcanolocist Dave Pieri at the Jet Propulsion Laboratory in Pasadena, California, "On my last visit to Hawaii this guy ran up to the beliconter to help me unload my equipment, and he had thermal burns on his face and big burn holes in his lacket from having gotten too close to the lava.

At Volcano National Park's Thomas A lannar Museum, adjacent to HVO, the charred flight suit and melted boots of a genlogist who also got too close-but lived-are a chilling reminder that, although rare, volcano accidents do hapnen. "We like in let genlagists get as close as possible to an eruption, but we don't

like our people fried." Johnson says: Volcanic eruptions are one of nature's most violent forms of evolution. Skin. eruptions in the crust of an adolescent planet, volcanoes are rooted in the houndaries of geological structures called tectoric plates and fed by mysterious "hot spots" where magma pools in bubbling reservoirs. "There are roughly six hundred active volcances around the world, and about ten percent of the world's population, some three hundred and sody million people. Tive on or near potentially dangerous ones," says geoipaist Robert Tilling of the United States Geological Survey (USGS). "During the Eighties we've witnessed the worst period of volcanic hazards since 1902, when unicano observatories were first estab-Ished. In this decade there have already been four major volcario disasters. Mount St. Helens in 1980, Mexico's El Chichon and Java's Galunggung in 1982, and Colombia's Nevado del Ruiz in 1985, Increased earthquakes, ground swelling, and other geological activity at Long Valley in California, Camp Flegrer ("Burning Fleid") in Rapida New Gunea have caused considerable concern service repetitive.

Thousands of enjotive yents have been active during the last 30 million to 40 milfrom years in the Cascades, the mountain range that cuts through Oregon and Washington But media star Mount St Helens is the one against which all others are maggined at least for this decade. "Since 1981, St. Helens's eruptions have haon relatively nonemiosive events in which magma rises at a rate we can monitor and we can predict when it's most likely to erupt through the surface." savs neologist Steve Brantiev of USGS's Caecados Voicano Observatory in Varicouver Washington. 'The slickest thing we've done is design computer software to display various data in real time. I can call it up right now and tell you, for example whather the cracks on the top of the lava dome are expanding or if there

the law control are opportunity of a finite are bursts of gas from the dome."

While screnitets study every sign of activity in Mount St. Heiers, local readents go about their business at the shopping mail adjacent to the Cascades Observatory, and trout fishermen cast livre into

mirror smooth crater lakes Beneath the lakes, huge plates of the earth's crust, miles thick, collide and melt, becoming the motion magnar that will eventually explit through the surface. What the longer the nagimar soles the longer it has to accumulate gas and become more explisive," says USGS volcandloger floy Balley Fortunatoly, the process is solve and adds, explaining that "inmorphobies, the

year—about the speed of cold tar"h is a Measuring anything in the earth is a challenge, however. "And the septically difficult with volcances, where things are cut of sight and out of reach," says Chris Newhall of USGS, "Still, HVO scientists track volcances remarkably well! HVO's dense network of seismo-

HVO's dense network of seismoapphs dedectic seven the slightest earth cusive. Its fillmeters measure musor ring probe dormant craters to study coding rates Time-lapse carnetar record eruptions. And NSA Hywert peint thermal podures of lava loose. The Scivog, "the sky detaining clouds of vayor, dust and ash oritized during eruptions. The experties warnine the chemical making, situative, electrical during and cropts to simple values of lava to a cropt to simple values of lava.

these researchers measure the supertri-

angle formed by the Mauna Loa. Hualala, and Kilauea volcanoes. And using electronic ranging devices, they periodically record the changes in the distance habitant. The peaks:

Carl Johnson and Tom English are more interested in tracking the movement of magma before it reaches the surface Their brite is real-time (or neight instantianeous) processing of data on the sounds and vibrations of even a seemnight insignificant earthquake. Their work is a stunning advance in volcano moniterior 1 Pailor sous.

Orn mally developed by Johnson and others at Cathon the sun of which the sun't parthquakes HVD's computer program analyzes HVD's computer program analyzes program of the sun of

don't brik there's aryone in the verid who can beat out time?

HO's elisborate network of electronic services and the time?

HO's elisborate network of electronic services or firty earth qualetes and their vibrations, which travels contward in concentric circles. The data are radiced to the observatory's twan computers, inchrammed after the Hawaian gods Kaine and Lono From there, the information processes to a Sun corre-

Real Ballian

Lying on the Bg Island of Hawaii, where Kilauna volcano erupis atmost coylatardy, and Stophen Language. Summing these supplies the Brand Hawaii of the Brand Hawaii of

tand works much like a diassmaker Depending on the size of the vessel he's creating, he dips a stick or log into the lava, twisting and turning it so the lava gathers and adhetes to the end. For a "gather" Lang explains; he removes the hardening skirr. from an nozing toe at the topi of a lave llow. He uses a shovel to scoop up. the viscous, grange, "goopy, peanut-butter-like substance," known as pahoston, snitts that the air like a pizza: rolls it on a rock or on wood; adds more lava, turns, oushes: and hammers his creation into shape. Then he backs his work in a five-gallon metal." bucket Cushioned in layers of peritte. it cooks evenly over a period of 12 to buckets from swinging against my legs as I hike out." he notes

My early pages were cluder than my more receive work. I was trying to somehow keep them true to meling the page to allow the crudents are believed beauty. Now I want the save to teach me what it does best I start call with a series of the strape and size, but hower know what the finished precent look files.

Backpacking a monte struct that rockules a metal nich, saw, shoos, brockes, handmatte loots, and placker, tang troks across several rines of hardening lava to fils windspace. The terrain is so convoluted, he says and the same of the s

The two result re delain. Lang has touch developed a featherfals one, sisters, and remain workable logical but touchs undamed by signs that warn of the danger it request it shorefra, and Lang prefer works; in solitude, left bappy, lowever to troub a partier of, knopsafallar, the touble-field-spe and late that spewi, more than 2 million outper feet of the majoring lend outper feet of the majoring lend out. There is ness to the majoring lend out. There is ness to see the size of the size to the majoring lend out. There is ness to the majoring lend of the lend to the size of the size to the size of the size

watch out for falling mosts in recess or conspined by lay and explainments in music poly more equipment to avoid an occurring last flow. These he an occurring last flow in These he crush the lays. Says Larg, whose Jordes include right-nig streams, but but each conjustic entire last but pain conjustic entire last hard in conjustic entire last hard in the last streams of the last set from the cause the side of they doub, closest to the last gets from a warmer

than the offeet sore.

Largh has noticed a lot of effocts and like perits onthe excitation of fire. On enother octasion, when the partined a surhorizon test some through hardening. Since "face beyond brough the leg like aboverprish of burning the major on the responsibility." The soleties and this down fire to length as the soleties and this down.

in a charred forest to esci oil. Having grown by in Freenc, Calitarius, Thave always loved the heat, says a say, who's resided in Hawas since 1974 but dufft begin working the first with those in the way until 1998. Sometimes, when thaven't been out in the heat or a month, Linuxer's pen ground before I staff to work and let the heat review me "—Debre Nyt Co.

puter workstation (dubbed Pele after the Hawaiian goddess who, it is said. If we in the volcanoes) and then to a network of

The vicionosis and then to a network of Magalimotro-Amgalimotro-Ompulers. All the entraince to the lab a monitor immilitarily flashes Xs on a many of Kalassas outlined. Blanks Xs on a many of Kalassas outlined Blanks demonstrating mortality. Aborton organisms of the computer is taking a poll and every station in the network has one valle Il morally stations agree, the computer deferrinces where the earthquake cocurred in facil, the center of the outritude lab priviled before the event has event trag-ported before the event has even trag-ported before the event has even trag-ported before the event has even trag-

gered the farthest stations." As Johnson speaks, one X flashes per-

sistently on a i nearby monitor. "It's insisting. / heard something, and the computer is arquing. No you didn't," he says The software has a built-in coherence litter it can distinguish between a real earthquake and the sound of someone beating on a seismograph with a stick or a wild nin or people walking

or traffic, the surf. the wind Prewously, scienfists could only bear rocks cracking," Johnson continues. 'We operated at a disadvantage because we couldn't see inside the earth" But seismic tomography now allows them to view a volcano's plumbing through computer maging much the way CT agans

analyze a person's bones: "Vis can still only see structures a couple lidometers wide it's like coloring with a thick crayon," Johnson says. "But we are seeing relics of chambers and conduits for new connections"

La HIVO osembolary fellow established to the HIVO osembolary fellow established to the HIVO osembolary fellow established esta

from the eastern side of Kilauea.

Al sel Populsion Laboratory, however, Dave Piert word settle for apylitring less than a real-time window on the entrie joined. The shaded violances from many lovels, including the most intimate whose you've crawing around on your heards and intess, afterd you'll sell in "Piers says. What in the properties of the properties of the properties of the properties of cances and other big features and dangerous events from space".

As part of NASA's Land Processes Program for observing terrestrial events from space Pierfs PIL team studies volcances from a converted cargo plane. The airborne violcano observatory is equipped with an arsenal of equipment,

volcanoes' surface deformethor." Pene says. Directod lowerd a senial mirror on the ground, a leaser been would bounce beach to the satelfile, he explains. The distance between the satelfile and the mirror could then be determined. Any ofference from provious measurements would indicate a charge in the earth is ourface. and charge in the set his ourface, the charges within a couple of indirect text charges within a couple of indirect. Moreover, Pene says, "ECS INAS/Ke.

Moreover Plant says, "EOS (NASAs Earth Orbiting System, scheduled for launch in 1998) will contain every known remote sensing device, all of them operating in fandem or in concert sing providing whole Earth coverage every two days." The closest technology to that now

consive venture that Prei consider that the consideration of the consideration of

ask for my gold

MasterCard

is Landsat, an ex-

Orbifing Earth at an altitude of 512 miles, "EQS will be affordable and more responsive." Pieri says. 'And as we accumulate a database, we'll be able to determine long term trends." Hoping to persuade NASA to establish priorities that will override routine observations he adds. "If a volcano is ready. to erunt, I want to



including a thematic mapper simulator that acts like a camera to create digital images. An advanced imaging scanner takes 'snapshots' of very hot rocks, and a thermal infrared multiprocedure coupons.

images. An advanced imaging scanner takes "imageshots" of very hot rooks, and a thermal infrared multispectral scanner determines the age, composition, and temperature of cooler rocks. "The instruments are sensitive to fractions of a degree," Peni says. "But I want to collect delay du rumanned sajolites."

Satellites infrared sensors pick up the thermal characteristics of the earth's sufface, and ther ultraviolet detectors clearmine the volume of lava and the distribution of gases in the almosphere. "But developments in satellite geodesy (fre procure massuroment of Earth's surface) may dause a rovolution in the study of may desire a rovolution in the study of know now. I want to be able to target other instruments on it and get the data out to the scientific community fast."

Pertils also worted shout NASA's Farth.

Sciences Geostationary Platform, ander disk collector fram rays be launched next decade. Exercisely five such platform—three American, one Japanese, and one European—will critit the earth at stitutes of lorty thousans kilometers (about 24 855 miles) and continuously cosone the entire plans, "I've says." The images might not be as clear and precise as those from EOS, but data will be gin accumulating the second any geological event begins."

Despite the development of aerial monitoring, most volcanic activity occurs commute on risks as 27

Ravings of a madman or prophecies of a brilliant scientist? Our children's children, this computer expert predicts, will be superintelligent robots, able to choose the form they take and their place in the universe

INTERVIEW

HANS MORAVEC

forever, Now forty-one years old, Hans Moravec expects that in 50 years his body and brain will be transferred into a computer and helt be immortal. In fact, Moravec would really rather be a computer right now. Specifically he'd. like to be a robot. A robot is just a computer equipped with a robot, the sooner the better some very sophisticated input and output devices: sensors claspers, curb feelers, and whatnot. Moravec has designed the

exact type of robot he'd like to be: a "bush robot." As its name implies, a bush robot looks like a bush, its arms breach out into bands, the bands into fingers. The fingers themselves separate into even smaller fingers, which subdivide into others. The process continues until the minifingers are tirry and delicate enough to manipulate individual cells. Each of these minifingers-billions of them-would contain its own sensors.

le's convinced that if he lives to be ninety-five he'll live enabling the conscious mind of the robot to have the godlike capacity to experience and manipulate billions of things simultaneously. Compared to an advanced bush robot, humans are a hobbled and backward species. As far as Moravec is concerned, anyone in his right mind ought to want to become such

> Morayec has even figured out a way to do it-a process called downloading. In computer science, downloading means transferring information from one computer to another. For Moravec, the human brain is a biological computer, and the human mind or personality is a complex pattern of information inside the brain. The "self" is just software-a collection of programs operating in the brain. So every last bit of that information, he says, could be extracted and downloaded to a more advanced, nonbiological computer outside the body the person's

> > PHOTOGRAPH BY MIKE MITCHELL



memories emotions intellect, talents all deposited into a faster more powerful mainframe that would then, in fact, be-

come that person

Once liberated from its former prison inside the brain, the downloaded "person' confronts and less mossibilities. You could be sent via modern to another city in a matter of seconds. You could be faxed to a distant planet, star, or galaxy "Perhaps," Moravec says, "you'd undergo some experiences at the remote location and then, if you'd like take your new state with whatever experiences you've been undergoing at this end * Or you could be equipped with the body of a bush robot and set loose upon the universe at large But in any of these schemes, so long as the computer in question kept operating you'd never have to die. Even if there were a power outage you'd have several backup copies of yourself precisely for

that eventuality The ravings of a madman? No. Hans Moravec is as sane and well trained a scientist as they come. He got his Ph D in computer science from Stanford, where he studied with the legendary artificial intelligence (Al) pioneer John McCarthy Today Moravec is director of the Mobile Robot Laboratory at Carnegie-Mellon University in Pittsburgh And Moravec is entrely serious about his downloading scenario. He explained it all in detail in his 1988 book Mind Children. The Future of Robot and Human Intelligence

Moravec has been mentally inhabiting the future since he was young. Born in Austria in 1948, he built his first robot at age four. With the pegs, blocks, and pullevs of a wood-block construction kit, he assembled a little dancing man That's not a man. It's just some blocks, he remembers thinking at the time. But it acts

Rice a mant

After his family emigrated to Canada. Moravec started building computers Although held never seen one, held read enough about them to design a few. One was made from radio tubes, another fransistors, and a third from rubberrbands and strings. Moravec was also a big sciencefection fan, and his favorite protagonists. were intelligent machines that outwitted their human creators. He's been trying to build such a machine ever since

Finally, at the Stanford Artificial Intelligence Laboratory, Moravec got his chance, building a series of robots. The first was Cart, an automatic car Then there was a trio of others named after the outer planets. Pluto. Neptune, and Uranus. Unfortunately, none worked as well as the mind children that Moravec was already envisioning

Cart took five hours to cross a room under its own steam. "Mechanically it was a pile of junk," its inventor admits. Today, at Carnecie-Moton, Moravec's new-wave robot, Uranus, can sprint sideways across a room in a matter of seconds. But that's

about alf it can do, which has led some observers to talk of a "promise-performance gap," a yawning chasm between what All researchers have glowingly preand what they have managed to pro-

duce in their laboratories Moravec, however, is not discouraged by promise-performance complaints or doubters. It's only a matter of time, he says, until some of his robotic children not only walk, talk, and think but end up displacing the human species, after a contest for survival of the fiftest

Snug, warm, and comfortable in his Camegie Melon office—outfitted with a refrigerator, microwave, toaster oven rice cooker, two TV sels a VCR, and four terviewed by Ed Regis Although Moravec seems fundamentally dissatisfied with humans as they are, the scrents! was, Regis observed, one of the happiest individuals he'd ever met

You'll be able to trade parts with other people: mental parts. If I cavet your writing skills. I might bargain

with you over how much I could buy them for or what of yours you'd trade 9

Ower You have no could that machines are superior to people. Where does this idea come from?

Moravec: I've always fixed being able to do as much as possible. And in the science-fiction stones I read as a kid. machines were able to do more than people. A.F. Van Vooris The World of Null-A was written in 1948 and was based on the first generation of grant computers. I really fixed this machine that was obviously smarter than people. Here were these people pathstically trying to think straight and this machine was doing it in spades and a thousand times faster! It was really nice to have the expanded possibilities the machine provided. The largest element in my "evaluation function" about whether things are good or bad is whether voulte able to do more things. If the machine can do more things, which it could in the story, then it should be harnessed

Omni: Maybe that works in fiction, but how about in the real world? Moravec: You don't have to look far to see that earth-moving machinery can dig better than people, airplanes fly better, boats go through the water faster. It's a very small extension to the idea that it's possible to make a computer that can think better than a person. Oranz How did you first get the downloading idea for transferring a human

mind into a robot? Moravec: in high school I had this friend named Ken Simonels who often raised questions just to annoy me. Once his claim was. "I don't believe a robot can have a mind like a human." He wasn't arguing that it was spirit that made it differont. There was just some mechanical reason you couldn't make a robot that

thought and behaved like a person I thought. Suppose you're a human being and your heart stops beating? Well they put in a papernaker Smilarly, if a given piece of your brain stops working why not replace it with an artificial part? Let's say you did this bit by bit until eventually you replaced the whole brain. Then you replaced the body, part by part, with the body of a robot. Finally what you've got is a robot with all the characteristics of the original person. That was the original instides

Omni: Just because an idea is possible. must we try to realize rt?

Moravec: If you have a really neat idea. I think you should do if because it will open up new vistas for you. If you have a few pounds of plutonium [[aughter]—hey po ahead! The Manhattan Project was

caught up in that Omnit "Technically sweet," they call it Moravec: Right That was the hydrogen bomb. That was [Edward] Teller and [Stanislaw] Lliam. And / can see it/ How can you possibly go around with this idea. burning a hole in your pocket and not try it? At least just once! Besides that, if you pull it off, what things might it make pos-

sible? It's like if there's a hill or a fence. You've got to climb over it Omar: If you replaced each neuron with spmething like a transistor, would it still

be the same person afterward? Moravec: That's like a question about a metaphysical thing that can't be measured. So what you can ask is, "Will this person treat his family or friends in the same way he used to or will he do his job just as well?" And the answer is yes to all of those questions. Every important function you can apply to the person is the same. So lid say, yes, in that functional sense it's the same person. There are still rifferences. If you give this person a CT scan, of course, you'll get a different result. That would affect other people disferently. The neurosurgeon who unsuspectingly put this person into a CT scanner might die of a heart attack Orani. Okav. what's your bush robot going

Moravec: If you had a superintelligent machine you'd want to give it superior ability to physically deal with the world Looking at living things, you find that humans seem to have the best general-pur-



say. "Yes, I'm still here I can see the scale

on the output of this computer displaying

what fraction of my brain has already

been removed, but it feels exactly the

Own: So the portion of the person that's still biological can access the data re-

moved from the neurons and transferred

to the memory of the external computer?

same as it did a moment ago."

places at once. Any of the limits you now have-one person, one body, one shape-wil simply be meaningless. You'll be able to transport yourself through communication links-to go from one phone to another and load yourself into a body at the other end of the line. There are many other possibilities. Omni: Suppose everyone you knew

opted for this downloading? How would you recognize them afterward? Moravec: Well, it could be a problem because one implication of this technology

is that you'll almost certainly be able to trade parts with other people. I mean trade mental parts. If I covet your writing skills then I might bargain with you Omn: What if you downloaded yourself into a computer and then decided you wanted your body back? Morayec: In a world where things that now

seem difficult will be trivial, you'll presumably be able to clone a new body for yourself it might be fully biological, including the brain, and you could have that brain configured with your old memories and so forth. Omn't So you could get the old body back. if you changed your mind?

Moravec: Or a facsimile of it Omni: What's the point of doing this downloading to begin with?

Moravec: Whether or not we do it, there are going to be intelligent robots in the

future who will design robots that are even more intelligent....much more intelligent than we are. These robots will be doing immensely interesting things and getting

the benefits from them, but I won't! They'll be exploring the boundaries of the universe, of mathematics, and all the other things I'm interested in. They'll be getting answers to questions I can only fuzzily dream about. They'll be able to preserve me immortal, without any trouble But it won't do me any good, because the robots are going to come back. with things I can't possibly understand. my brain being as small as it is. So maybe. I'd like to join them. Frankly, this was more. of an issue when I was younger. As I mature, personal immortality is not that important to me anymore. But I do have a kind of paternal feeling for these potential robots I want them to do well Omni: So you want to do this not to help

people but to help robots? Moravec: To help our descendants, yes Omn/: Meaning the robots? Moravec: Well, yeah

Omni. What's the timetable for all this? Morayec: Fifty years. That calculation is based on a comparison of the part of the vertebrate nervous system best understood-the retina-with computer visual programs, which are among the best understood parts of future robots in that comperison. I find that a retine is worth

about a billion computations per second. the equivalent of a Cray supercomputer The pervous system, by extrapolation, is capable of about ten trillion computations per second. That's at least a thousand times more powerful than any computer now in existence. But computers are growing in power a thousandfold every twenty years. There are enough developments in research laboratories to sustain this growth for at least the twenty to forty years required to achieve this opgration level. At that time, the machinery will be powerful enough to support a human intellect

Omrir: Might robots wage war against us. or maybe even each other? Moravec: Yes, I imagine that really opposing intentions (forces) could escalate to things wo'd recognize as were But these things could be averted more often than they have been in human history. Aggressive, protective, territorial instricts were terribly important to humans in the past, and that's why we still have

them. In modern contexts these instincts are often inappropriate. There's no reason to kill your neighbor because his chidren broke your window. But this happens in current society. Although we're unable to change these things in ourselves. in this future world robots will be able to edit out overly appressive behavior Omni: They could do the opposite, too

pose system for dealing with the world. It. nyolves our hands, which happen to be composed of fingers. The hands are sttached to arms, the arms to bodies. This two-level branching system is a large part of our dexterity. We can position our hands anywhere and, by using our fingers, apply grasping forces at that location. But there are many things that hands can't do. They can't hold seven things at once and are limited in the fineness of their manipulations. But all of this can be solved if you just carry the idea of a trunk. limbs, and fingers a lot further If your fingers had fingers, and if those fingers themselves had fingers, and so on, then ultimately you could hold billions of things

The not effect is a machine that can. by touch, get an instantaneous picture of the world better then the picture we get through eyes because a billion fingers is more than the number of light-sensitive cells in the retine. The robot could also affect the world in an equivalently highdata-rate way. It could do a billion things at once, including taking a nervous system, or whole surface of a nervous system, and teeling out thousands of millions of neurons simultaneously

Marayec Right. The brain and computer are working together until finally you've Omni: So the robot's fingers will "read" gone through the entire brain At that the data off our brain cells and enter that point, your whole brain is replaced by a computer simulation data into a waiting computer? 78 OMNI

fingers will feel out the brain's surface. Moravec: The best analogy right now is nenhably telepresence. Suppose you but moking electrical even chemical connections with the surfaces of many neuon this ning helmet, which has really great room at cooke. These attile fanciers will food TV screens to look at. Suppose there's a back neuronal signals to a big computer robot somewhere else in the room with that will simulate these signals. Gradually TV cameras for eyes, and its eyes are the robot's fingers work their way down connected to the screens in your helmet. You see what it sees. When you turn your into your brain, layer by layer, tearing off head, it turns its head, so you instantly ittie bits of neurons and passing them back in a little bucket brigade. In the have the illusion that your center of consciousness is two inches behind the romeantime they'd maintain all the functions of the neurons they've removed. bot's camera. This has been done, and Omni: In the process just your brain it's a completely yield and realistic expebeing systematically destroyed? rience. You put this helmet on, look Morayer: Your brain is being destroyed around Where are you? You're teleand replaced by a computer simulation. ported into the robot's head, and your but your train of thought is not intersensation of consciousness is there now A downloaded consciousness will be runted. You're able to have a corwersation while this is going on. You're able to something like that

Omns: What happens to the person's old, biological body after the downloading has

Morawac: Whatever the person wants Assuming this is a voluntary operation and you fully accept that such a transfer preserved the person, and all their projects. desires, and dependents would be just as well served by this new form as before, then it would be perfectly reasonable to neatly dispose of the original. Omni: But what would you look like? Moravec: You're going to be much more flexible in your appearance because you can change your body and be in several



The tiny village of Elmwood in northern Wisconsin just may be the new hot spot for UEOs:

AUTIMATTER

The wilage of Elmoword is engaged in a water surrounded by wood iter region in a water surrounded by the rolling hills and vordant farmland of orthern Wasonsin habitants of the Irenat, however, and as uneventful as it morphs seen Acousting to Mayor Larry might seen Acousting to Mayor Larry and tracting unexpected with the control of the Irenat and LPD involvant and LPD

UFO UPDATE

ies falle husband. George, changed from a continued LIFG kepper to a believe. Returning from his sinft of police duty in Ermond, he tot! Dens that a brighty it, significant has districted ell affiliation and the significant prime beliefly that he level that is didn't. A year laker flores picked up the level that significant his significant prime belief to some quarry he said, and he screened. "On, Ged sond he has other URD 'Driving quickly to the spot, Dons found he has partied lesting a grant his got as to horize and entering the spot lesting a grant his got as to horize and entering the spot lesting a grant his got as to horize and entering the spot lesting a grant his got as to horize and entering the spot and spot and the spot and spot spot and spot and spot sp

George Wheel's father described his encounter with a sax one-stipped oblight that had listed on a histode. He sax he approached the eth punts a blue light fleshed at hist Daris claims. Such an over recalled which tepped eth milt. That saxis yeer, Emmood housewide Corol Foster and those shall incline where drawing about throw milts from here which they inclined with locked the an unusually being at "Suddenly I kinded," Perfort rays: "It was two or the sax shall be such as the control of the sax shall be at "Suddenly I kinded," Perfort rays: "It was two or the sax shall be say to be say the sax shall be the sax shall be say that the sax shall be the sax shall be say that the sax shall be say that the sax shall be say that say the sax shall be lengths ahead, ova shaped, and covere

As word of Whater's of periences spreachrough the comment, more Elmwoonalives came forwar with tales of their own "At least twonty-fit very reputable periods and their own the have come to me."

"At least twenty-fivivery reputable people have come to mipersonally abousightings," says Mayo Feiler "And I mino talking about lights ii the say."

seem to be taking their reputation as a UFO mecca in stride. For the past ten years they've held a three-day festival each July called. UFO. Days. Weber hopes to raise.

S9 million for Elmwoods own UFO (anding see, "Soundst it be on call," he stys, in case "contact is established" UFO skeptb and avakon journaled Phi Klass questions te real motivation behind Elmwoods interest in thing sou are, "if somebody asked me how to make a thy town no cody has over heard of internationally famous, I'd say, An

Jeros In C. H. J. Sauties, livelies that Emerged is a general of good for In Ord adoptive Her ords, new-view that building is a design of good and provided the second of the mysterious coeff. "Money needs to be out in a part indirect entrang secretion research! Schmitz depart in Julies Weber. Schmid depart (securine has twatever keeper urung up in the dabs and hills of Emercod is frendly "Weber. Schmid depart in the second of the second with the second of the



DYING TO BE REINCARNATED

According to the Chriselesspaper Women's Daily.

Edit Sug gift in solution to Chair a Solution to Chair a Solution to Chair a Solution to Chair a Solution to Solution the Chair and t researcher Lucy Davidson of Albinzarsays, "If a person believed strongly that they were smily moving from on ite into another, it might make it essent for some popula to table that filted." Moving the make it essent filted. "Another had been author of Your Part Levis A Romozenation Hambleck (Harmisel) Books), has another point of view. Scrous students of remounsation, the says, would never consider support.

gand. We have to come back and face exactly the same lessons precisely where they left them off."

It historiats of Toronto Med.

same basical pocusive. The same basical pocusive through of though bed at School or surchpracing to the same basical pocusive through of the same basical foliation and same basical foliations are such as the same basical foliation and same basical pocusive through the same basic pocusion of the

SOUL MATE

Have you down text you could read you make time? Bor you feet you've always! known claim of the? You may be "soul makes," predestand fewer garned tirrough as many se 25 or 30 lines separaing thousands of yeurs. That at least, is the year of Dels Suphran author of You Were Born Again to. Be Togother. "All of you important rela-"All of you important rela-"All of you important rela-"

ng, best friend, or worst nemy in pastilities, Before inth the two of you worked ut who will pitsy which part is is incamation and what secree you will by to mader! But Herbert J. Freudenbo ger, a New York clinical isychologist for 33 years,

gor, a New York Clinical psychologyst for 33 years, has doubts. Even if reincan nation were proven, he say the soid mate cookept is not something. I'd promote 'Truty unconditional love, he says, his blind and unhealthy it leakes and open pain and makes one vulture.

he asys, "a bind and his hostilly it feliose and open to pain and makes are subspanled to a person who may not be on the up-and-agine pine of them, in the Ecopyring failusts and living in approof them, in the other hand, can lead to a healthy love. You derive to go through earlier felionation and the second of the first and to allay! Interested "White for Subplem at Box 35, Malbut. CA 90266... Phogy Noscan

sacret we met—In sience neve, that thy heart could get, thy spirit deceive."







ROBIN NOOD



NAME		
DORESS		
-LUCARES		
CITY	STATE	75

CURIOUS AROUT YOURSELE

If you have been wondering just where in all the haze and maze of "our" Universe you truly belong, write for the newly published book

TABULA RASA On the manifest need for fundamental philosophical redirection. A consistent, comprehensive, rational and consequent world view and universal perspective

with conclusive findings. THE LOCOS FOUNDATION for the furtherance of fundamental philosophical thought and inquire.

P.O. Box 758 Carson City, NV 89702 Tay deductible contribution \$10 and up

much appreciated to cover cost of ads, printing and publication. Gratis to amone unable to afford at this time otherwise, "just your check is your order." Allow a few weeks for delivery.

INTERVIEW The Mysteries

build better bombs and so forth Morning And if they decided their own survival would be enhanced by if then presumably they would. There's also nothing to prevent insanity in these things. no reason why they wouldn't formulate an axiom that's at variance with reality. But, resournably insome robots would do very hadly for themselves and sooner or later he waped out by their saper neighbors. wha'd be doing much better

Owni: Will the human race coexist with or be replaced by these robots? Moravec: Superhuman robots will remember how human beings used to be so if for example, they find a planet where they decide it would be nice to have humans, they could reconstitute people from their libraries or other records. Humans will never cease to exist as long as robots

continue to exist, because the robots can fully reincarnate people at any time. Whether humans will continue to exist on Farth-well maybe. It'd cost the robots little to maintain a nature preserve where humans could live. But you've got to remember that the human being is this very limited thing that won't be able to participate in all the good stuff that's going to be going on. It'll be like having a dog in the city. The dog can get along in the city if you're careful, keep it on a loash. But it can't work automated toller ma chines, drive cars, or fly airplanes. And it's going to be the same with people We're going to be so enormously out of our league if we stay in these bodies and brains that all we can hope for is to have specially prepared areas set aside for us where we can't get into trouble. They might use humans as tous, or maybe nets. Superintelligent robots will have great diversity of behavior, so maybe some will

choose to keep human pets. Omni: Are you sorry you're human? Moravec: Without humans, there'd be no hone for any of this. These robots are really approx to be our children. This is our destiny to become something vastly greater than we are now something we now just have a hint at. But if we weren't intelligent, we wouldn't have that hint Omni: You don't see any problem about a person losing his identity in the down-

loading process? Morayec: Well, yeah, but people die anyway and lose their identity. And there's no way we keep our own identity, even as individuals. You're not the six-year-old rivited your proce were. You're somebody else who has some memories from back then, who is shaped by events from back then, but who is a different person Orror: As a human yourself, can you really imagine what it would be like to be a sunerintelligent robot?

Moravec: Of course not. To be a superintelligent robot is something far larger

of Mind



THE TWO WORLDS WELLVEIN

Man is not just an isolated entity on Earth. He is also of a greater world—the Cosmos The forces that create galaxies and island universes also flow through man's being. The human body and its vital phenomenon-Life-are of the same spectrum of energy of which all creation consists The universe is you because you are one of its myriad forms of existence. Stripping away the mystery of these Cosmic forces within you increases the nemonal reality of the Self. There is no adventure emater than the exploration of Self

This Free Book

The Resignations, a worldwide cultural organization, have shown thousands of men and women how to rationally explore their inner world of Self. A yast psychic psolm lies just beyond your conscious mind. It is a link with your notential creativity and attainment. Not. magic, not fantasy, but a revelation of the fullness of your being. Write today for a free copy of the Mastery of Life. It tells how you can learn and use more of what you are

- The Rosicrucians are:
 - Not a religion · Non-political
- · Non-profit Cultrall-free 1-008-05-AMORC Ask for Operator BP., Scribe BP.1
- ROSICRUCIAN ORDER, AMORC Resicuetan Park San Jose, California 96191, U.S.A. Gentlemen

I am air	c	ri ri	l	ï	4	ė	1	è	ď.	٩	и		۰	80	,	۰	,	L	,	۰
Name																				
Address	٠												٠						٠	

The ROSICRUCIANS



IT DOESN'T MAY FR IF YOU THINK

STEEDPHONG HOLDDY MIC' DOUBLE CASSETE ALBUMS

Floots bot using anatomich "so middels, your either not interested in press
my district, a your site delighteres to day.

SYNCHRONIGITY*
1-8097622833 004-364-2323
CALL FOR A FREE SAMPLE SYNCHRONOCITY* SOUNDTRACK
(9 am to 7 pm EST)

than I am. It greatly exceeds anything happening in my mind right now. So imagining it essentially means simulating it in my head. And my simulator is not nearly powerful enough to do that.

Omnit What's life going to be like in your postbiological postbiol

rent life is to that of a lizard.

Omni: Will there be gender, male and fe-

male robots? Morayec: Not unless for some theatrical reason. I expect there'll be play which will be just another kind of simulation, and play may include costume parties. But sex is a very specific mechanism invented by evolution for reasons there is still debate over. Part of the answer is that sex-as opposed to just cloning your offspring-allows for greater amount of variation from individual to individual. Sex is a consequence of the way living organisms represent genetic information. But in this future world, reproduction will be through means we now consider cultural Loombine my ideas with yours, and so on. And for this we don't have to decide who's male and who's female. I just adopt some of your ideas; you adopt some of

mine. We can still be different, not clones of each other.

of each other.

Omni: Today people who have multiple personalities are considered a problem.

Why won't this be a ninhiem? Moravec: The problem of multiple personalities is that they have different goals. for the body they're controlling. The anals conflict, so what one personality does may embarrass another personality. In the future, you'll have to find ways to integrate. If you bring in a complete model of somebody else's personality, you can just out them off in an advisory capacity in your head, simply discuss things with them from firme to time. Occasionally you might hand them the controls so some particular skill can be appropriated. Lassume that kind of dialogue goes on now between your brain halves. In split-brain nationts the two halves seem to have slightly different ideas about what's the right thing to do, partly because one half may not understand something that the other does

Convir You task about people merging with animals, too Wharts the point of the Moraver. Animals are not the nomenthes that humans sometimes treat them as. The long evolution that, say, a bird has behind it has produced some skills not lound anywhere in the human race; the ability to localize sounds, to fly You might, well borrow those skills as much as any

human's camentry skills.

Omati. Su musa people download? Can they choose to set as ordnary people and continue to eat, dmik, have soci? Mourace, it is very base people processing the continue to the continue to eat, dmik, have soci? What is the continue to do the things the continue to the continue to the con

Moravec Well, it will be You'll be building your own successors, so you can wire in whatever you want frem to enjoy. Suppase you could review yourself, as the future organisms will be able to do, and you decide it would be every derivity out could enjoy calculus. That would be very semile. You'd were the Farm donn't enjoy calculus centers to your pressure cefter. Then you'd really enjoy doing calculus.

you'd really enjoy doing calculus Omni: In the past you've said. "My genes are my enemy." What do you mean by that statement? Moraver: It's an evanneration, but es-

Moravec: It's an exaggeration, but essentially you can view humans as the coevistence of two parts not completely comfortable with each other, mind and body or your cultural part and your genetic part. Both are striving to reproduce themselves, and both are potentially immortal. But the things required to reproduce one are often not the things that help reproduce the other. So there's competition and tension. I myself am much more proud of my mind than my body and wouldn't be at all happy if I had offspring that preserved my biological parts and somehow totally lost the mental part. Insolar as my genes have different purposes than my mind, the numoses of the genes are working against me

Owner: So then you look upon DNA as simply the mechanism that got us here, and nothing more? Moravec: That's right: Historically DNA is very interesting, but it's not something that

should be preserved above all else, in particular above what we could do with our minds. Omnit: How would you feel if you suddenly discovered your wife was an intel-

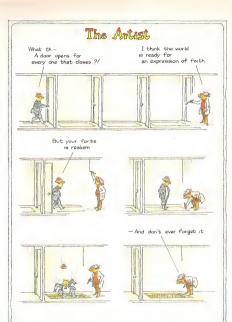
ligent robot? Moravec: That would be great! [Laughter] it would certainly raise things away from the mundane.

Omnit: Did you always want to be a scientist when you given up?

Morawed: I wanted to be a scientist very
early on, oven before I was willing to adearly on, oven before I was willing to adearly on, oven before I was willing a composition.

In fifth grade, "What Do You Want to Be
willing to be a composition to be a creporter in the record of the composition of the co

to be Superman, but I didn't think I could say this in a composition. If I was infimate with somebody, though, I'd tell them. But honestly, I didn't want to be Superman,



either I wanted to be Lex Luthor Superman's enemy. Lex Luthor was really a much greater achiever than Superman. With only human abilities Lex Luther sometimes exceeded even what Superman could do

Orani: What was your favorite subject

when you were in school? Morayec: It wasn't really mathematics. I guess science itself, but it wasn't taught well, I was in a Catholic school, and evolution was faught only very grudgingly. One of our science books written by nuns, said that the three states of matter_solid liquid and gaseous_reflanted the Trinty the triung nature of God. A little Thomas Aquinas nobt there in my science book! Evolution was presented. but in the sense of How could arrivant possibly believe this? But I was reading a lot outside, and that led to my rejection of religion. I was fairly religious at the time. but finally I decided that the things I was being taught in religion just did not pass the experimental test

It seemed less radical to say that a cloud of bydengen existed at the beginning of the universe than something as complicated as a living, thinking being Even then I had a sort of mechanistic view of what thinking was about. I never fixed parapsychology, either It was too mystical. There was no mechanism there No damned cogs and gears!

I didn't have the hostilly for literature that I had for sports. I was actually hostile lowards sports. Literature I thought was really boring. I thought. You know these are just people interacting. There's nothinn else I can see this every day at home Owny. Why did you feel so hostle to-

ward sports? Moreveen It seemed enmelow not the way to spend fime. I was good at running and things like that, but I hated organized sports. During my third year of high school Lwas building this robot at home, and all through gym class I used to megine how really neet if was going to be when the

finished robot crawled down these painted lines on the own floor. That was my mage week after week Omni: Did you ever finish it? Moravec: Yes, but it moved so slowly that

it was hard to fall whether it was really following the lines or not it won a science fair prize though Owni: Are you signed up for gryonic susnension after rieath?

Moravec: No. It seems such a crude technology. When you resurred a person who has died of old and that norson is more than half oone already. There's been senous damage, insufficient repair of that nervous system. I find much more palatable the idea, which five written about that it will be possible to resurrect dead people from the traces they leave in life.

A sort of superarchaeology. I developed this idea in the final draft

of the book, but I think it's completely reasonable. From the potsherds and few records that they find, and also from their general knowledge of human nature, archandonists can reconstruct plausible historical dramas of what may have gone on then. If they had more precise data these historical dramas could be constructed more accurately I'm imagining a future in which the quality of the data is vastly improved so that for example, a whole planet can be scanned at atomic resolution and everything that's buried

there can be found. By then we'll have

amulators that can simulate large quantities of matter quite accurately One way of interring what the past was like is taking a measurement of the present and rupning a simulator backwards to construct a plausible past for everything that you know it doesn't have to be a simple physical simulation. It minht use a kind of reasoning that archaeologists of that a Shortock Holmos would use The net result, if you do it well enough, is to reconstruct the nest at such a level of detail that the entire physical structure of a person plus their mind is available Throughout their lives, each person has effects all over the place. They've left traces, diffuse records, in everything they ever touched, every person they've ever

Free Six-Pack.

An offer from LifeStyles° condoms vou can't refuse.

LifeStyles announces its new range of condoms with this exciting free introductory trial offer!

From Ultra Sensitive and Vibra-Ribbed to Extra Strength, never before has one condom brand offered such a full range. And for a limited time only

LifeStyles will send you a free Sampler of all six. along with a personal carrying pouch and valuable coupons which can be used in neighborhood stores across America.

Sampler today. LifeStyles® from Ansell®

Try them now...send for your free LifeStyles

AMERICA'S #1 CONDOM COMPANY

LifeStyles

P.O. Box 429, Riverside, CT 06878 Please send me my free LifeStyley® Sampler of six condoms, Bonus Free

NUME ADDRESS

Offer limited to one per customer. Void where prohibited by law

suede-like carrying case. Enclosed is \$1 to cover postage and handling

talked to, every piece of dirt they ever kicked. You'd try to recapture all that. Orwin lan't that very mixed up and jumbled together now?

bled tagglet row? Moreover, be, but how much information. Whe they were at how much has merely been elitused? Quantitum-has merely been elitused? Quantitum-has merely been elitused? What a co-ton around of that look here given of information and the same to specify that a co-ton around of that look here given of the same to the

nersonality which if turns out, wasn't all

that elegant. So any reconstruction you

make will have to be consistent with all those brings. But an adequate reconstruction will have to be consistent with vastly more than that To be a good simulatorum of the real Issac Newton, this resurrected Issac Newton will be able to think all the houghts that the ongniel Issac Newton is recorded as having thought—and probably a whole for their and probably and their and probably a whole for their and probably and their and

Omnii What if Isaac Newton doesn't want to be resurrected fixe this?

Moravec: What if you don't want to exist right at this instant?

Omnii, Okay, that's true, too. What's your

next book. Exceeding the Coemics, going to be about? Morrawe About those ideas that were too far-out to go in Mand Chatdren (laughter) time fared, for example. There are pleny of potential opportunities in the new physics, especially in general relativity and quantum mechanics, for getting intermetance and four the next such that is immediately and the complete of the properties.

This means there's a real possibility for time machines. Much more so than when Newtonian mechanics seemed to be the explanation for everything. Orani: Do you think there's anything that's

truly impossible? Morawani I have no idea what the extent of totality is. When I say "universe." I generally mean this twenty-billion-light-year bubble we see as the visible universe. But I'm virtually convenced by theoretical physics today and by general philosonlical feelings, that the universe the lotality, must be larger than that Much. much larger! Just what the ultimate scale say, because we have no real knowledge of what the ultimate scale of things is. But if we do choose to stay just the way we are now-human beings on Earth-the almost certain outcome would be that we'd cease to exist. Sooner or later something would banned that would be brevond our means to control. And if would destroy us.

But senously, I don't believe that the choice of remaining just as we are now as human beings is open to us DO so OMNI

MAGMA FORCE

commute received in underwater. Tens of thousands of relatively new volcanose—and even older, extinct ones—dot the ocean floor. And submarries eruptions account for approximately three quarters of the new laws college-section certifies are the seets.

imately three quarters of the new lava spilling over the certife surface each year. In 1988 the USGS and Bratian's Institute of Oceanographic Sciences employed the Geologic Long Rango Inclined Asid (GLOPRIA) sonar system to map the sealloor around the Hawaiian Is-

clined Asdic (GLOPIA) sonar system to map the seafloor around the Hawaiian Islands. A torpedic-shaped instrument towed behind a research vessel, GLOPIA sweaps sound waves across a 20 milewide swish of ocean to produce photolike images of the ocean's floor. The industries propositive has been

used to map some two hundred fifty thousand square miles and to survey much more," says Robin Holcomb, a geologist with the USSS. "And it's turned up normous undersee landslides, hundreds of volcances, and a very young lava held the size of Massachusetts."

The discoveres, lowever generate more questions than answers. How were the lave fields created? How by is the Hawaiann hot spot and how long still it continue to exist? And what is the relationship between large-ecal submitted interpretation valuations after a large-exist submitted valuations after all temperature valuations after open surface of the small temperature and the small temperature. If the same of the small temperature is a small of the small temperature and disturbances are small for those as small field. The same of the small field welfather patterns workload.

Geologists know that the Hawaiian Is-

lands one day with be submerged link the reas of the Howards—Empriso Seamount chain, an immorise submarine ridge stretching from Haward to the Albeddan lelands off the coast of Maskar. Still, seekties twee supmosed when analysis and water in the stretch of the coast of the underwater landsides ringing the Nawaison Islands showed that mome volcaroles colleges almost set lest as they grow Philographs of Lohin a velocation grow Philographs of Lohin a velocation grow Philographs of Lohin a velocation provides the properties of the Haward reveal a massive record of the contravar table than the smooth conference conferen

structure of volcannes above water

Currently observing Lothi from Pisces

Video peda submorphies, respectives at the Hawan instituto of Georphysics pinh to install mote than 21 miles of sheerpher both the continuous dela insertination for continuous dela insertination for continuous dela insertination. Selective Froutistion is also considering an unmanned lab on the seafloor where we will be able to do all the things that are now done or land. Hitcomb says in Hawan where the instantia are still in the process of credition and the state's HIVO volcanifolosity are thorotopic.

mersed in their subject matter. Most of

the observatory's staff live in the tiny village of Volcano, a rainbow-denothed fem-cappeled community perpending with sulfurous lava vertis. And at least once a week the observatory's Tava walkers' trudge across the funalified landscape to Kupaanirha a shehing, loobial-field-size lava lake that spews more than 2 million.

tava lase that spews more than 2 minor.

Louise feet or motion magining part day.

Most Coursis in however are established.

Most Coursis to however are established to account the min of its crater, of stake a like whore excupsions or manifest draits. Unlike volcannologistis, we agritished stake of the coursished out on locit loward the read-hot lood of an activities with one of the enought. Where a thin share of hardening lead these societies with one that the smooting lated these societies are developed to the second of the course would not the second of the same with the course would not the second of the se

Maunce Krafft.

Lave begriss to harden, even as it occess for way down the slopes. After 45 minutes to an hour of supposure for art, lave forms a 6- to 12-moth-thick-crust final is refailingly age to towark on mit helps to week good boots. "Mann says." But you can even unches analosis You year have to trop read fleat And even if some siven sports you may have to the prediction of the action of the mit of

in 1987 Marri and Krafft were both covering the tale of Bob Paoluco, whose Hawarian homestead was being slowly consumed by a sw-mileilong lava flow Each day, the lava overran another 10-to 15-foot-wide strip of land. "It was occur-

caling to watch." Mann recalls.
Although Pooluce finally gave up and seed out, Mann remained behind with Krafff until another "monetous longue of white-hell level" began rushing toward the house. threatening to late pit wom was the final seed to the seed of the seed of

says "I'm always amazed at how afraid people are of volcanoes. Lava flows are peaceful just beautiful. With ashestos suits and gloves you can even pick up lava and as it hardens, make howts out of it." He admits, however, that because of the hazards involved in raffing on a river of lava. HVO may not authorize his titanium-capsule experiment. Still, two French aerospace companies are interested in designing a vehicle that can withstand 2200° F temperatures for one hour And if Krafft can t perform his experments in Hawaii, there's always Reunion's Furnace Volcano, which erupts about once a year, or even Etna in Sixty, he says. One way or another, Dr. Vocano.

intends to fulfill his dream CO

Volcances like those in Hawaii are just

a nieasure, a defight, like a toy." Krafft

WOMF

AACIAID

ercise, recommended by obstetricism Rene Van de Carr, president of the Prenatal University in Hayward, California, should help you immerse yourself in the

feelings of that long-ago nurturing place Begin by learning as much as you can about your mother's pregnancy, including the details of your delivery. Yet Carr reminds us that whatever finedication your mother received before you were born was also received by you. So you should consider how this may have influenced your feelings—perticularly during

your passage from the womb.
Choose a quiet evening when you can relax in a warm bathlub in the dark without being discurbed for at least 30 minutes. Before getting into the water furn a radio on at low volume between stations so you hear statio but no volume or music. Then get into the tub, take a deep breath,

and get comfortable. As you still in the dark, feeling the warmth of your aquatic surroundings sopering into your body, consider the experience of your own promatal divelopment and birth. Van de Carr suggests my you then "remember a time when you carrie from darkness into bright light such the people around you appeared mon-

Potential benefits. The darkness, warmh, and ratio state may simulate the conditions you experienced before birth and allow you to magine yourself returning to the moment your conscious swareness first began. This should provide you with a penid of incredible cart. As Fener Van de Cart says. "If you don't find yourself returning your birth experience by practicing this exercise, at the very least will excerne

thirty minutes."

EXERCISE FOUR. FE IAL ATTRACTION Because not everyone can directly experience the feelings associated with being pergnant, there will always be dimensions of the poratal experience that are beyond some people's reach Psychologist [cmr. Schwartz, author of The World of the Uniborn, suggests the following guided-magery exercise for over-coming, this limitation—and getting in booth with your persiatal and but the expe-

nence in the process. Begin by lying on your back in a clace where you can relax shi get comfortable without being disturbed. Obes your eyes and notice your breathing. Breather guesty and naturely, allowing yourself to become more and more deeply relaxed as you observe each breath. Then put your hands on your studenties and imagine that you can feel a baby developing inside of

ined sensations to excive naturally continue paying close altertion to your toroiting region of the death feesth you take its about the entire of the continue paying close as the sensation of the continue paying the payi

As you magne your breath flowing between you and the belay, tocus on shifting your perspective—as though you are becoming the belay breathing and worth. The worth, Schwartz points out, is a "world or terreberging sound." Consider the sounds that you see likely to be hearing at the more than you can be hearing at the more than you can be consider world but also your mothers heartheat see will as your own What impressiones do you form of the custod world band on the veriety of sounds the world. Dated don't be world. Dated don't world. Dated don

Imagine yourself as a developing fetus, becoming larger and heaver within your michier's body. Notice the feelings this exercise stimulates within you, as thoughly ou were observing your feelings with the mind of a letus. When you feel ready to complete the exercise, take a deep breath, open your eyes, and consider any emotional effects this expeniate any emotional effects this expen-

ence may have had on you. Poinnels benefits "You may not have lower that the unborn barly breather likely invited the substitution of the substitution of guided breathing has been an important element of medistain since amount limes. This exercise, therefore, can help you meditate upon your fetal development. It may also help you feel empathly for both your mother and your unborn set!

EXERCISE FIVE: BORN AGAIN

Sometimes reenacting certain aspacts of a previous experience can help stimulate the release of latert memories from your uncorrectous. This conceplorms the basis for an exercise suggasted by psychiatrist Stanislay Cord, au-

that of The Adventure of Self-Discovery. To conduct the exercise you'll need to convene a group of about ten friends Everyone should take turns lying face down on the floor and playing the part of the haby. The rest of the group should silently gather around the "baby," placing their hands at various points around the heliv's body. At an agreed-upon signal such as a nod by one member of the group, everyone should place an even intense (but not crushing) pressure on the haby for about 30 seconds. Then, follow inn a second signal, the entire group should simultaneously release the pres sure. At the moment of release the baby should roll over on his or her back. The entire group should then carefully lift the



haby to weist level and mently mock him

or her back and forth In Grof's view the experience of rocking simulates some of the sensations of moving through the birth canal at the time of delivery. The exercise can be

conducted with or without music playing strongly recommends Mozart. Whatever music you choose should include a neaceful opening gradually building to

something very gowerful During the exercise, the individual playing the role of the baby should just relax and focus on his or her physical and emotional feelings. "The expenence can be outs intense, depending on how much

tions. 'This is not an exercise to be approached lightly."

For a more dramatic variation on this exercise. Grof recommends using the following approach, originally developed by psychologist Elizabeth Feher. The members of the group should get on their hands and knees, side by side, nrestand up against one another and alternation facing east, for example, the next one faring west, and so forth. They thus create a long tunnel of bodies on the floor. forming a kind of adult-size birth canal.

The person playing the baby then crawls through the tunnel, imagining that he or she is religing his or her high. The individuals forming the tunnel should detherately make it somewhat difficult for the person crawling through, squeezing the baby slightly as he or she passes. To make this simulation even more realistic. the only way out can be through the legs of a nerson forming one end of the tunnel. As the baby exits the birth canal the group grove again lifts and tooks him or her in the air

Grof cautions that this is not an exercise for those who have emotional problems such as claustrophobia. "When people get close to the experience of the birth process in this way, they can really start getting into it, feeling claustrophobic and struggling. This can trigger a nowerful emotional reaction, so it's not really something to just play with." You may therefore want to consider conducting such an exercise under the guidance of a sympathetic therapist

Potential benefits: Although this exerase may sound like a fun party game, it can actually be a profound and moving expenence. Even if you do not remember your birth, the interaction with the group can make you feel part of a loving and supportive whole.

EYERCISE SIX: THE EYES OF A CHILD Our final exercise, recommended by clinical psychologist David Chamberlain author of Babies Remember Birth, is one that parents can carry out with their young children. According to Chamberlain, this 95 OWN

exercise is most effective with children no more than three years old though it

can be tried with older voungsters as well Choose a personal moment such as a child's bedfire or bath time, and ask, "Do you remember anything about your hwth/2" or "Down i remember heing born?" Re careful not to pressure the child, but

words in his or her mouth, or plant ideas by asking leading questions. Instead gooth invite the child to sneak about the subject if he or she wants to do so. Allow the child to carry the flow of the copyerealine, displaying interest in what he m she has in say in all likelihood the child will abountly conclude the eyemite by changing the subject on his or her own front you can gently conducte it yourself by saving something like. "Thank you! prossure unuse and so forth "Gret cauenjoyed hearing about that "Remember

Subfly change the subject only when you teel it is appropriate to do so Don't be put off if your child's descripton seems to stem strictly from the imagnation, since this may also dive you special insights into the inner workings of his or her mind. Just say, "Well, that was very interection," rather than invalidation of contradiction the description. In any event initiating such a notentially significant level of communication is likely to processe the level of respect between you

and your child "It's a tribute in a child's memory to presume that the child is carrying something that important around." Chamberlan ponts out "it's treating the child as more of a human being than we are usually willing to do."

Potential benefits: Learning to love your child may be easy, but learning to reenget him or her for his or her unique thought processes and capabilities may racritte a more deliberate and concentrated sort of focus. This exercise may asset you in this process and thereby help you strengthen your relationship with vour child DO

EGGETON TRADE

The following will be offered as prizes in the Soviet edition breasure hunt (see page 16) 1. Jamo art speakers (2), 2. Oitzen calculators (20) 3. Samsung portable stereo

units: 4. Smith-Corona DL1500 Cvrillo keyboard electronic typewriter, PMP 3000 personal word processor-dual Cyrillic stereo phones 6. Gusdorf furniture (two wall units, two wardrobes, two bureaus two bedside tables). 7. Frankin com puter dictionaries 8 Casio electronic keyboards (2) and watches (4), 9. Gruen Soviet-military-style watches (300): 10. Jacques Morel leotards, leggings, and Tshirts: 11. products from Waldenbooks. 12. asserted offt packages from Walker a Scottish bekery, 13. Shulton fracrances (vanety), 14. Headstart III computers (5). 15. Blue Diamond (assorted ruts) 16. Darker Berthere Bussian Monorolly (RC)

sets), 17 La Prame coemetica

ARTS

to tomple, allowing more light to enter and making the weater's face and profile fully visible. "Experienced divers aren't used to having all that peripheral vision. "WSM president Scott Millard says

With the helmet's communications intercom, six divers are able to converse among themselves underwater in earlier movies, such as The Deep, and in television's Sea Hypf, voice-over or dubbed dialogue was added after fifming had been completed. Arcraft-quality micro phones in each of the ten belinets constructord for The Alvee franciar onabled Cameron to record the film's dialogue directly on tape as if the move had been filmed on a dry shooting stage. WSM also created the film's sleek, high-

tech hacknack which includes a lightwoight battery pack and buryancy control. in addition to the diver's air supply "Although the backpacks were meant to be only move props, they actually sustain life" says WSM's Troy Kirby, who maintained the company's equipment on the set. "We had to make them look futuristic without changing their function."

To accommodate Cameron's desire to film without spotlights, WSM integrated Underwater Kinetics' 150-watt light into the backpack system, powered by the battery pack. Like a gooseneck lamp, the Inht snakes from the backback to the holmet and can be directed as needed. The specially designed backpack valves and WSM's fabricated "riss station" enabled the actors to refuel without surfacing, a process that normally takes at least 20 minutes so as to avoid the bends, a sometimes fatal disorder caused by a too ranid decrease in an pressure. When the Abuss cast and crew ran low on air, they simply swam over to the underwater unit. blooked up to it, replenished their oxy-

gen, and then swam away WSM is not planning commercial production of the Abyss backpack and helmst, at least not immediately. "We're dond to confinue developing the helmet." Millard says, "although it's not the kind of

helmet you'd see in a diving store. The likeliest user would be the military. The harkmark moreover would have to be modified. Because of the film's requirements, they were heavier than those now used by divers

Cherokee itself may go on to serve the space program. After the Abyss cast and prew packed up and departed, NASA officials toured the site to determine whether the water-filled tanks could be used to teach astronauts how to assemble the proposed space station. In any event, the nower station will still be available for other moviemakers. In fact Owensby says, Submariner, a film based on Maryel Comics' aquatic superhero, is expected to begin filming there soon CO



grams and grams in doing biggssays, and the majority of compounds can't be sunthesized economically." Fauliner says if may be possible to grow sponge cellswhich he believes could prove one of the most fruitful sources of marine-derived drugs-in culture to produce the large amounts needed for research. For some other commounds however there may be a catch-22 down the road: "You need a source for them if you're going to market them," says Faulkner, "and it's by no means certain some of those compounds can be obtained in large enough

culantities to manufacture Despite these obstacles researchers have several success stones with the promise of several more on the way. Dolastatin 10. a notent cancer drug derived from the sea hare is "contrastically about a year away from human trials," according to G. Robert Pettit, a chemist at Anzona State University Pettit, who isolated 40 senarate ciclastatins from the sea here and tested 15 on animals, says dolastatin 10 has cured mice with melanoma and doubled the lifetimes of mine with lockemia. Doctors are preparing to begin ofinical trials on bryostatin, a le ikemia trealment derived from the Buguta neritina, a liny marine animal. Trials are already unhe says. "There are basically four phylader way on didemnin B, a nowerful actitumor agent isolated from the Carlibbean funicate, which is a leethery binb commonly known as a sea squirt. Suffness of cancer will respond best to didemnin

says doctors don't yet know which types B. so they are testing it on patients with lymphomas as well as those with lung colon breast, ovarian, utenne, or prostate tumors. "Because it's a very notent compound, the initial clinical trials were done very cautiously." Suffness says. During the first phase of the trials, where we test for safety in humans, the amounts were escalated gradually on a preplanned schedule until we reached the

level of maximum acceptable toxicity." Although he believes marine pharmaceutical development suffers from insufficient funding. Faulkner says many recently collected samples have properties that could serve as the starting point for formulating new drugs. "The hit rate on merine samples is much higher than on

terrestrials ' he saus

When Faulkner goes looking for samnies, he watches to see which seemingly detenseless creatures a reef's predators avoid. If an organism can't swim away or fight off predators, it stands a much higher change of defending itself chemically and harboring medically useful compounds "I think we know where we have to look."

in the ocean that are going to provide future drucs sponges funicates (hermaphroditic manne chardates like the sea squirt), bryozoans fimmobile aquatic invertebrates that reproduce asexualivit and gorgonians, or soft corals."

Mangalide, the new ant-inflammatory commound doctors will soon begin testing on humans, comes from Luffarietts variabilis, a sponge Faulkner collected during a diving expedition near Palau in the western Pacific. Most anti-inflammatory drugs, such as aspirin or indomethacin (Indocin), merely suppress the compley interplay among chomical messengers that gauses inflammation and associated risin. Mannalide how. ever, blocks the release of the enzyme that starts the process, thereby preventing its occurrence Allergan, Inc., a Calforma subsidiary of pharmace itical cient SmithKine Beckman, recently received FDA approval to test mangalide's ettectwaness in treating psyclasis. Scientists testing the drug say it could eventually be used for acree and other inflammatory conditions including, perhaps, arthritis Even if mannalide doesn't make it to the market itself," says Faulkner, "a product based on it will make it. If s a question of proving that the material is safe and can be given with either no or controllable side effects. That's the issue "DO



STAR TECH

ACCESSING THE FUTURE



FINGER-TAPPING MUSIC

Make music and a feshion statement with specially designed contacts that are embedded in a glove's finger lips and connected be a uneoctave-range computer

uctavu-rangu compater chip. The gluves are available in yullow and blue vinyl. Price: \$22.95. Contact: Majon international, Torrance, CA; (213) 791.1003



PALM READINGS

Detescupe combines monecular, compans, range finder, and chronometer to let you take your bearings une-banded. H's waterproof and robbertzed. Price: \$445. Custact: KHV Industries, Middlebown, Rt; (401) 847-327.



BUCKY'S BUILDING

Buckminster Fullow combined tension and integrity to form heasegrity, an approach to building that creates structures whose wholeness is maintenined by network of palling forces. Price: \$27.50. Cuntect: Tensegrity Systems, Tivali, NY, (800) 227-2316.



well os hoges checks. Prico: \$99. Ceetact: Vistatech, New York; (212) 254-9851.

GAMES

By Scot Morns

Did you play with an Etch A Sketch as a child* Do you remember the flustration of trying to create a decent disawing or a recognizable signature, making mataless and having to try it over and over? Are you like the Orror editor who confessed. The best I

could do was make stains? If so, you may find the images on these pages hard to believe. Artists such as Jeff Gagliard, Steve Hanks, Gaye Wurthner, and others have recently been proving that working on an Etch A Sketch can be a

lot more than child's play. On an Elch A Switch the drawing is done with a melal siylus that moves behind a Mylar-copield glass window, scraping away the powdored aluminum and plastic boads that adhere to it. You control the sayus with two plastic knobs. Turn the left one for norizontal lines, the night one for vertical. To produce diagonals and curves you must work both livebs at once.

One of the challenges of Etch A Sketch art is working within the limitations of the small TV-shaped screen. The canvas is always the same size (five and a quarter by seven inches), the line drawn is always the same width, and the background is always the same silvery grav. The restrictions of the medium are so severe that etching a sketch worth saving is like designing a maze and then tracing

through it in ink.

The hardest part is that you must draw one continu-



Artist David Sosalla created the piece above, titled An Exposure to Impulse. Sosalla is a visual effects supervisor for Disney Productions, creating movie creatures for feature films.

cus line from start to finish, since the stylus can't be removed from the screen. You have to devise ways to move the curror around the screen without messing up lines already drawn. And you can't selectively erase instales to big and your good is imparable. You just have to shake the

plastic frame and start over Interruptions pose a problem, too. When you come back to a half-finished drawing, you may not be able to tell where the stylus is "That's one of the hardest parts finding the end of the ling," says artist Steve Hanks. "Often I just have to miggle the dials until I see if the stylus move"

This is a flegie, transfory art form, as ephomeral and temporary as sand castles. Joste the screen and your creation may be destroyed forever. It has been called a pure American art form, but, in fact, the original concept was invented by a Frenchman, Arthur Grandpain, 30 years ago The Otho, at Com-

ago The Onio Art Company of Bryan, Ohio, refined the idea and introduced the first Etch A Sketch models in July 1960. An models in July 1960. An in 1978, broasts over 10,000. members, ranging in age from six months to seventyfour years. They publish a quarterly newslotter, report on contests, and showcase selected works. BUT ISIT ART?

Jeff Gagliards was trained as an artist at the Brooklyn Museum AT School and then wert on to attend the School of Vasial Arts in New York. He finds that people who wait his Boulder, Colorado, studio often pass by his enamets, ofe, and computer deagns but are retarnity drawn to hes lich a Seatches. Tim onto

offended," says Gagliardi.



Clockwise from upper felf. Gayle Wurthner's rendering. A Viser from a Tallet, an old Rolls, a Jeff. Gagfaird creefont, an earlo shop by Steve Hanks, Lisa Parsona's Lock Ma, Four Hands!

"This is bably boom oco. | Gadfaird has also tried. | pennid who assume the

This is baby-boom popart, and it's fun to see the reactions of people" The typical first reaction is rishelid he says "I've watched people at galleries discussing my work and they say. 'He silk-screened it 'or 'He burned it on.' They come up with technaues far more difficult than ust twisting the knobs because they can't believe i really did it that way. But by twisting the knobs alone. Gagliardi has reproduced the creation scene from the Sistine Chanel. ceiling, the corner of a fivedollar bill, and a still-life. study of old tennis shoes

to break the usual limitations of the medium. His Mona. Lisa is in a vertical format, which required drawing the lady on her side so that the dials would be at the bottom of the screen He has also made broken-Ine drawings by carefully inverting a partly finished sketch and tapping the titled frame so that the aiu minum powder spills onto part of the picture, obliterating the connecting line between one part of the sketch and another. "It's a laborious, fime-consuming technique," Gagliardi says. "but it really impresses

people who assume the ine can't be broken. Steve Hanks of Albuquerque, New Mexico, is another artist recognized for his work in other mediums (several of his illustrations appeared in the December 1988 issue of Omni), but he too often finds he gets more attention for his Etch A Sketches than for his oils and watercolors." learned to draw on an Etch A Sketch," Hanks says. "I got my first one at age ten and then got another one every Christmas Because of the publicity his work has generated, the Ohio Art Company sends

Harks free "magic screens" by the boxload but Hanks says he prefers a well-used slate to a new one. "On used models the knobs get looser and easier to draw with 11 trade a brand new Etch A Stockth for a used one any day."
Hanks has he sewn way.

of saving his works. He drills holes in the bottom of the frame, gently shakes out the excess powder, sprays fixative inside the frame, seals up the holes, and puts glue on the knobs

frame, seals up the holes, and puls glou on the knotes so they can't be turned. Gayle Wurthere, a set designer and societic at such movies as increased. Hoosess, and Crepshov, says that she appreciates the discipline of the Eich A Sketch. "It's a good mmmiliat exercise it forces me to simptify my art." Wurthner has done landscapes of Wane and studies of market.

ner has done landscapes of Marine and studies of male nudes, but my favonte is a work she did in the smallest room of her house, titled A View from a Tolet Wurthner often paints gray borders around her selecties to reduce the cofor contrast. "That red obtain: frame is a little same.

on the retina," she explains.

Most art entics still don't
consider Elch A Sketch
renderings art, although
collectors have paid up to
\$300 to hang these works.

Is it art? The best answer I have heard is the commont made by a Santa Fe artist when he first saw a Steve Hanks portrait. "It's got to be art it's got at the frame around it." OCI



There are plenty of advantages to emigrating: No Super Bowls. your life gets botched up by live bureaucrats rather than by computers. and people like Geraldo are sent away.

emigrate to Russia. With the new era of there is no reason to but off that longdelayed move to the homeland of Gorby Sputrik, and the original Dr. Feelgood.

himself. Rasputint

Fer's face in the United States is a great country, but it's not for everyone. It's overnin with come and corruption. and your can't get good barscht. It costs education and health care are free, and you don't have to worry about parking because hardly anyone has a car Job prospects in the USSR are brightor, too, especially if your occupation is professional atheist, or Slavic dancer There are other advantages to living in botched up by live bureaucrats rather than computers, and people like Geraldo Rivera are sent away

States has open elections, which means similar candidates. Iweedledee andcharade, nominating one candidate who combines the qualities of both Tweediedum-Dee-Dum-Dum-Dum

You should also get acquainted with Russian history, which is dominated by the cases. Probably the most famous ozar was Peter the Great. There were lots of other coars, though, and you

1 Fred the Mediocre Hey not every American president was a Lincoln. so why should every czar be Great? members of the Great family, Alexander and Catherine Fred was history's first Evolution, that famous period in which

2. Larry the Pabulcus, Larry was the first combination obat and interior decorator. It was in apposition to him and his preference for paisley that the Bolsheviks declared they were But enough history, you're in Russia. and you need a place to live. There is good news and bad news. The goodnews is that there are apartments aplenty. The oad news is that they're all occupied (This is a classic example) et Russian humor tithe five year washing list for apartments can be shortened by doing what Bussians in the know do

det discounts on waiting periods for singitiments, cars, and inclures on the history of the tractor in Bussian musicals. 2 'Get addressed. Due to the housing shortage; after a couple mames, both families after move in together. So show up on moving day. The graom's family will assume you're a mention of the

barriered all your goods with English writing on them, that dreadful day will come when you'll have to seek out. a Russian store. Shopping in Russia is: one thing, finding a store in Aussa Istricky. The is herause they don't have overy window. But Russia, reas learned. from such mistakes, and today great progress has been made in announcing store locations. You can easily find a carrol tung fish in the window lets you par of plans lets you know you've found

Another way to recognize a store is by the lines outside thine initiate. and there will be colling in it. This is not

the police station.

seek is what wo river in America money bungry salescierks by to "bein" you whether you want doesn't take plage in Russia. In lact, disturbing their peace and quiet. Here is

Customer, Yes, To like to see a par of

Salesperson, Sorry, we're closed. you stand in one line, point to the chrown you desire and do your best impersonarea of the lase Lean of Brestmey II the clerk likes your performance she gives you a sales receipt which you take pay the clerk hands you a slip to take to The number three, where you got the chicken and a change to extilit your talent on the popular Soviel TV show Starski Starch. This routine not only outs. down on their but allows a shopper to

an exciting and rewarding experience if basic sources like lored paper If you find month's follow-up article "How to Get the Back Out of Russia DO

Stan Sinbero had his bags packed evol ne