**EXCLUSIVE: HOW TO BUILD A REAL ALIEN!** 

# CARL SAGAN & ANN DRUYAN ON THE ORIGINS OF THE SOLAR SYSTEM FIELD GUIDE TO

XTRATERRESTRIALS

1150 **KES OFF** CONTROVERS COSMOLOGY

SPECIAL





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### DEPARTMENTS

**First Weed** Caling E.T municationa Frank 10.0 Martinine 18 Funda 33 25 28 -35 35 By Peter Callahan Carmen



beamse and the won-<sup>32</sup> clean it contains. John Berkey's over suggests that is harbos other Me, alters of the sort that performants in a fearmeting confirmence meats each year. (Addbrane and and and photo credits, page 71)



44 On Earth As II is in Herren By Cas Sagan and Am Duyan Revealed the creation of Our solar more creation of the eventor more as of the eventor of the eventor of the sector of the Sol How to Buff an Alfan By test Band an Alfan By test Band Sol Fotion: Yonus Is Hell By Lota Walamson

How to Save the Space Program By Jany Gray

A Channel for Science Fiction

Stephen Mills

The Bubbling Universe By Thomas R McDonough and David Brn

Conflict

By Dennis Overbye 101

Interview By Doug Stewart

Anti-Metter

China

# FIRST WORD

THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE The goal is to answer age-old philosophical questions about ourselves

### By Frank Drake

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My scientific colleagues raise their eyebrows when I speculate on details of appearance but 99.9 percent of them agree that



This article is excerpted lines a new book, *It Areysons* dist There?, by Frank Droke million Schell, petitished Dist stocht, preistore of astronomy and estrophysics at 10-Satra Enzo, end petitishen of tests in Schell of the SETI forestitishes atternistis Werk, Calibertia. other intelligent ife lowns existand that large populations of them max infiltrate the universe

Personally i find nothing more territiking then the thought that radio messages from alten ovizations in space are passing through our offices and homes right now, like a whisper we can't riske home.

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could repeat Project Owne do could repeat Project Owne today in a fraction of a second. We could soan a million stars or more et distances of alless a Mouseur/ light-years

And we will Such a search is planned, funded, and ready to begin operations this month—the long-executed NASA SET Micro www.Chaervert.Proact

Until the tao 1980s, cut intoleity to hird another oneicador temply meant that we had not looked long enough or hard emough. Thistee to detect after in billigance in no way proved that enderbereeksis did not exec. Risher, our efforts were pury in relition to the commity of the task.

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Just de car table trivit de terreterier troestaarts leide inte angeen, canrywg newe of occi existence, tatine states may treate been artivitig di Lastin for bleine of yaken. Some may even be montoent message en regateling alen outburk, Indery, and technology. Many angobjoedies worth of intermation could be transmitted (and reowned) aaler and chaptiv.

Though SLT essence openopenerations diameters and secnal texpansion, the pool of the searching is to assume appoint photeophysical questions about parsolves.--Where did we come from? Are we unspar? What does it mission to be harmen?

Buch houghts and no to altempt Project Cerm - sharp may performant an universal and share angiovernet ware public include. All that time, no sourcetal tabled temusally skatus tablements. If the overted War Allon rediation betwares and upper created and overted War. Allon rediation betwares and upper created and on maps of the Galactic centre, and measured kersur's temperature was ta reliable speatrum, Buch had a long way to go before my oster Was porces.

Project Doma failed to defect adhatmatival intelligence but sucorected in in demonstrating, our groups accreative real to SETI. It als supportinged SETI as a legitimate, do side accentific endeaver. And in samulased activity anceng othors who shored our interest but had lacked the means to saech.

The MASA SETI project culturnetes the quest that Cerne start ed. According to the Davie Equition, approximately 10,000 adwanced entraterestrial conitactons share our Milly Way galaxy Any one of them should have something of supreme importance to all us DO

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### READERS' WRITES:

Unchained memory, the love affair continues. and the magic of reason and rhyme

### Message in a Pottle

Increase Democrate (Check) Melocides June 1992] the carefulness of his re-His conclusions, however, are not the only hypothesis. If these experiments formers its reachborrin cells to react its

the survey southern and react differents members and sensibility officially death d

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Don't Shoot Me, I'm Only a Scientist nexted Scientific Enacts' Llane 19621 taked to include the Warren Commitsion sinfamous ' single builet' or 'map gation for the JEK reseasanation. Even I it is concerted for the sake of artisment that the maps build theory is with-

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Isanc Asimov will long be remembered Herndon Vé DO



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# FORUM

### SCIENCE AND THE EDGES OF INFINITY. It's Omn's fourteenth birthday. Help us celebrate our mission?

By Keith Ferrell



"Show ere" is the motio of solence, and today's scientists are showing as wunders we never





the activity of the second of the indexistory particular to understanding of the surversal, two it was created, here it has could where it is headed. Perhaps not since the series years of the series of the terms that a series much terms and excerning. It he tested of cosmology and astraphases, with record discoversal and amapties corring. It beams

This month we calibrate Ontos focusents another entry of its appropriete that we devote much of this special reacts to match of the mysecial reacts in match rand the workcoge have served as one of our import focu, enound which much of our relational emphase relatives.

Now, more than ever, we nor rememp our determination to bring to you the latest and most existing developments in this most ultranear of sourching latest soorpang ground, and in the soorpang ground, and in the year to come, with be tampang accurd some of its more retered, by register belong an external accurd some of its more retered. To register belong an external accurd some of its more retered.

It is going to be fun, and some of it may be controversall Centently the world of Lowarce can be as control to Lowarce can be as control to the control of the second second second (And probably a lot men inhered ing the head of a president conpager, and the lowar a keel of any depletion and the second second and the two second second second and the two second second energy of our conditional countral server divergiant views of the it in the intervision of the it in the next second second second second second second and the it is the second s

That's as a should be and

brings up a topic that the same isunderstood by all Crivin residenbut may be less clear to these mot a tarinare with the vooling of soence. No field of subroce is statiery process, just be tron to many of the areas of this sounce investigates. Each resp. forward in ourverbarituating of the universe calls into question previously field and "instrumentation" frast

The many people when the set a flow in the source memory and the set evidence that individually and the set of regurners is the time, ofset new set of the set of the set metabolism who are therefore and advatation in the control on the the set of the

Well task a certainly important becuful in to retainly important becuful in to retain and the sense of science is skepticities, not task the set floop at acetais care from a soft of unversal Mesour-"Shoe me' is the webbieved of scientific training.

Sometimes the skeptosim denload to basis desagneermit even volent ingurmer! We vie covered a manifer of these arguments in Omm and will continue to be More often, the spent of sweptod ingury leads to agreements to deagree him but potte debate, dwitergee we fungerstass.

The popular press, of which Cmm's indeed is part, too often plays a noile is encouraging pubic mesoprehensen of how coence works. A good exemple is the Hubble Space Telescope While the faws in the tolescope is oristruction are incourage. It much of the press coverage of those faves implied that the de-

vice was totally unusative, a damater for unavers. Realing actual be further from the truth. Even a particular of the large state of the large state of the large state of the unaverse gave go us programs fur baryotid addition good and anywares of workers and anywares of the unaverse gave regenerate of these largest and the state of the unaverse of the largest and the state of the unaverse of the state o

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Our you at Centres to tensible forces thought exponentias into clear and striking proto and graphicos, to share with you the best and the brightest examples of curnert thinking, to make available, in our pages, as much of that inness latoretry as we can

It's a pbi we lowe and theasure and i don't think that any of us inverived in this magazine would hade places with phyone in this world to other once. And that's isopecially trus each year when our birthday role around

So help us blow out the candes if you will and join us for a cosmic birthday party as Crimi turns 14 CO

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The SorFI Channel it's coming to honopolit you to workla of intragmention and instantienvenet beyond your widest channes. Science facton, science fact, fentasy and clease hornor. All in one plans ...26 horar a dief.

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# MEDICINE

### LSD PSYCHOTHERAPY

A promising Swiss experiment proves more than a trip down memory lane

By A J S. Rayl

or most people. LSD conpared up visions of the Sahees the psychologic tays when ocurrierculture rebels turned on sured in and dropped out. That since abuse percented USD's demine-

Initial more proper control town however, in that that more that dowing chemical was considered by wonder drug. At the time it was beened in the enry 1960s, more than 2,000 eventies and staked on the population of LED as a fromment to meaned internets and other

New studies show the infernous 1566s drug in he potent against mercentality

and cover drostext: After undergoing LSD psycholosapy, an anorecic wernas beean to est anner. or afflictions appeared in respected izurnels around the world

Despite its early promite huninded of at ucies were stypped midghean. Now timps are begrinning to open up open," stype Abert Holmenn, BB, who has styntheoraed of learge and dethylsocial-25 more than 50 years ago while working as a releast the second and the second dethyltement. These always been confisient that the fields about LSD would come usi."

Indeed, researchers are offering LSD a second chance. Although only a hendful of U.S. re-

searchers are pursuing LSD smimail studies, scientists in Holmann homains are conducting intrograms areas, on human schacts in 1965, the Saves gowerment looniest a group of psychawara to use the drug. They are treating patients suffering from patientify discrimination such as an order, and degreesent

The isoteria flow documented area 160 case duales on the milfoscy of LSD an initiative and the flow of LSD and the second second property of a resolution is an international contract, second and prostance with a lot on international contract, second initiative and the second second prostance and the second prostance with a list one provide and the second provide and the second provide and the second second initiation provide and provide the provide international initiation initiatio

The Beels doctors are adminished being 1000 is 200 microgram doees of USD to enhance the Newspeutos processes by making reprovesses by making reprove accessible. This offlers from the psychologic strength-200 micrograms—off Sandor's USD-30, or the strend favoritio. Overlay & Orange Sunstrimwhich induced a protound peels microgramme.

How to their first LBD exector, the Breas patient undergoal leats six months of thready to nee out understatul for twon LBD thatagy would be inspeptiale. These on the eady of braiding does are distributly fol good concludents ' any Six Mensevie, to preserve for their thigk, 'patients read up on LBD and most in the same batter antibinity on the test journey table that minds. As Sixk acaptants, 'The expension can be highlening i

Style describes a system service to Homoverk dome, the patients attend a session on Prisky abornose and this start the experiance on Batartite experiance on Batartite experipatients, who are not bising drugo-guide engit to ten paterrise on their traps, which tast down, min borns. Another doctor, door, Myrt, edimentaries the drug in patients assigning

While psychological breakthroughe usually occur in bothproup and individual sessions, individual sessions, then both of suita a catalyal in the thempartic process. USD fooltates getting reto the mind indivpresend anotone more quesky<sup>2</sup>, says Rob. "Conce the breakthrough is softward there is usual mind work to do."

Bo fair the Sense expensions show LSD which is not addictive, to be a potent throughouts tent that even relevance pakers addictors to addice and and addiction Adds Styk. "In common theme among the patients who take LSD to before addicestern."

The outlook for USD therapy in the United States, however, esensiduabilal "While we are hopeful," says Potent Zanger president of the Californiabased Abart Holmenn Roundabon, we are well exert that legering governmental concern his made approve and hind's for new studies very difficult. CO

# POLITICAL SCIENCE

### FLIGHT OR FANCY?

Vertical takeoff and landing craft's upward mobility

### By Tom Dworetzky

Loopes grd a constraint working and lights dedevidenment with dedevidenment and dedevidenment and deaded devidenment and debeen a helicopier and a frootwing arphane VTDLs could prove a rowkinnery addition to Amendat constraints that the ment of the devidence of the prove a rowkinnery addition to Amendat constraints that the prove a rowkinnery addition to amendat constraints that the prove a rowkinner addition to amendat constraints that the prove a rowkinner addition to amendation the additional to breaking of our dismission in global energy of the additional to discuss the glo begade instraint ow to be order uses.

Arphanes are done they were been building as to largely her decades the Department of Detreme that arroyally think largely tange of angely think largely and here been been been been and here that the astrong as you use them to beneficip perperities that the astrong as you use them to beneficip perperities the sensities random worke getting into are largely ageneral toolw asket introny to

Problem is the industry has made ends much by selling last year's models at the global arms bazase, with some unbritunale results. For instance, we indulged in an expensive overclas device ed premerty to repolasissing, metaptrocess, a occoder work of a spherocess, a occoder work of that was pold to basics in husses that was not only bad for ince, it was not yob basics of the ore, now get to pay for David Brom to david yet method work and way approximationdary approximation of a strain of the sphero of the sphero incertain the work are always approximationdary approximationbasics have id to thoroands of shallow whithing betting the phase of the sphero of the which or hope of search [the phase op was in Kurn].

Enter the V-22 Opprey, a modest vertical takent and landing sitroter cash this a DC3-stord critar with motors that can point tak to takent and leading and totate forward for crusting. If's also an excellent candidate for camelsen from military to child in uses

Also slaurodry olemmig Pert the V-22 was budget listificaperk burget, the Administration is having year in 5 Corporation al preserve. In July if Invertied occurse and occurse listication to development of the oppy by Biol Networks and the Agrin and Beerg Hallocated in the key nu addecidal discolated in the key nu addecidal disc

Enough beltway bickering. It wouldn't be the first time military

manupy primed the pump for GMan technology. Heliosophies ded correlators Bayrol making work by American YICLs such as the Oppiny work of America Sampertiation devices and the American work of American YICLs insult on transact, that all pots American on databane to an transpertiation databane to an transpertiation databane to an transpertiation databane to an transpertiation bair closed on the corrected analisment of the transpertial and an antipation and the transpertial and the prime and the transpertial analisment of the transpertial and the transpectial and the tra

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# FUNDS

### BOOMERS ONLY: Goldan parachutes for life's second half

By Linda Marsa

These corrects exerting the neededbody that if hard not to bottom domination to nanoal mixeds contrastrated by nanoal mixeds costs, there goldon yeass may be anything ball. Tables will gataba up here goldneededbody and the set gold or set and the set of the tables of the set of the tables of the set o

Prepares let the second half of our Tives will be antirely differed than it has been for provises peneratoris when penels tailed in physically cobeauting take

Experts have taken a freshtook and the taxes is not nearly so part. And borners have gonten a burn rep. They're not selfraidapart—they were ask born at the wong inthe tencedy, the demographic changes this gold us into the mease in the first place will be whet it therefore they is in out.

"Closery service assume the foure will be available to both;" any Richard Japoten, a creattert at Hussen Institute in Indianapois. "But numerous studies abov acobies in their take achies are as productive and quick to glapp nee shifts as those decades younger. There uses acreaated to be a state of the state of the ministers for and but in term-but ten's much lear in the tile quarties (the term).

There's pike a carcity of transformer and the second point and her shortage will be scool by contary send. Baky bornes, the most well-advaced generation in lasticy will subdenly this teem polyes counted by enclosed. App taxing the status biology and the status of the second working in the lastic point terms biology and the second working to the second second working to the lastic point terms of the enclosed working to the second second second second second enclosed by the second sec ers, in irving, Taxas, "Working well into our seventies will be the norm," along with feedble working smangements to accommodate the eldery.

In fast three displaced searnby line workers who are rotraning an unwiting paneers. They are the fast www of Americana to embatik on second and oven third careers. "Saving \$7.000 is year is out of the question for most poople but you can do a



heat of other things to avoid being Instability squeezed in your later years, "anys Mercoldh. Cheil among these and acquiring potent, design publishing, or how to repair electronic equitoment—to repair electronic equitotity insed of the curve when the economy open these the union.

Even on the Brench site, fere is good near. The periodal savings rate of 4 percent is at an alterna law But that needs to be put in period. This is according to a 1991 Uthan instruct report our percent had the lack to be members of an unusually brin with cohord between the 18200 and the 1940s and rode two decados of explosive expansion in the 1950s and 1950s—which is why they had plenty

In Derhalt, the leaders of the local baby boomself orthonic on the the laby boomself orthonic on the bescale at a stepfarm control the laby boomself of the laby head the comes and sense of set in encomes and sense of set in enternisms, in the work of the laby bescale of the laby head the stephane, and the laby head the appendix set in the next on the next optime, and decade of decent graves any in the next of decent graves any in the next of decent set of the next on the next of the interview of Manaca delight the set when leading adgle boomself. Set well person when it set macade

The time measured and the second seco

And late statters can still catch up take a doyaer dowoman who has accumilated a \$25,000 met egg and control lates an additional \$2,259 mich year. If she swetts her morely in vulky, her saving 10 parcent an rually, her saving will balloon to \$500,000 by the time ten to \$500,000 by the time ten to

And dent nee out involves ablations correg up on the horizon. New Stries-style continuums among invesced strapped sonloss "Chances are in the sure people will had a way of horizon a combinable relevant." Says Enails Zolowski, actring director of income security and benefits Enails Zolowski, actring director of income security and benefits people to the Utaban Institute. "Tostyles could be a list of different time what here are loss of CO

# WHEELS

ACHTUNG, BABY: Germans perfect the recyclable car

By Melanie Menagh

A you're peuring along in hinking about is jarking this fourhybridio destiment, fo your exocess and good testiment, fo your exocess and good testiment, fo your exogout fivor a BWW Would beek you'r haart tothiek of it corregipted to a score heep, wouldn't it?

When Bermana, renowned fo

their passion to things automotive, see too to you want to be an exclusion on even of car exclusion as it broaks their hearts for different ressons than you might aupert. Own it amilian automotives are screepied each year in Gammary, each representing half for diffungs like interand solo class bestic.

and other materials—some of them highly tools is a hitten with impedirecement hearings reliably that most preside of all reliable hearing of lightly town of edemine car manufacturos have been working of lightly town of evideoing a completance progrant to recycle automobilities when they reach the end of their useful free.

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anything alias that could be enterby dropped and depoted of Today, in auditors to hister traditional anotherisk the wavestige calls aliac comprised of 250 pounds of 20 different: types of planticscenterings mound with other that hands costly rare matate like plant hands to costly rare matate like plant hands that used autoreants, exbestions this used autoreants, exbestion. Set of high proma-

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 and designing cars specifically to reary disastantialy

Caviously, car companies can't go it alone on this type of propot. They ve enhanced the heap of other businesses into the saled industry to deves more efteent methods of producing highquality uncel from scrap, and the obstace industry to develop imm-

> pier and, hance, mora assity reconditionable plastics in addition to developing new produost for national indutives, the auto-resistancetion proper us failing the development of a new inclusing There will be a been in businessis devoced to disassembling cers and diversing ac-

citil techniques and equipment to essist in the process

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# MIND

BORN TO BELIEVE. Your values about God, home, and country may be influenced by your genes

### By Kathleen McAuliffe

Sometical levine. Mark Newman, and Jenny Levine Training the when three waves main tends to be an any service the service could have a service of the service local service of the service of the biolicities, they three dense on near biolicities and three three three biological three dense of the biolicities of the service of the biolicities of the service of the waves of the service dense of the waves of the service dense of the waves of the service of the service of the waves of the service dense of the constraints of the service o



errine—including the identity perality. They firwing support a wornants right to obortion. Neither arbende infligues services withough both believe in God Says Netwman, "We agree on ratedy most percent of thrings. These most senous designeement? "Holikes the Westmight Redektion [prefer the Datas Convolus".

Reared-apart twins who grow up to hold virtually identical opini ions are a cultious phenomenon. Many researchers have dismissed such uncerny emiliantee as one of thire furny quilks inthorum but, no more significant cl a dopper bond then say kurging min instruction al perty wearing min instruction al perty wearmaterial thread wear in between the abel operations and the transmission abel operations and minigood wear and entry and and and in that access a potential and minigood wear and entry and and and instruction and and and and potent and those have long been used an a beamter measure of normeroped attraction in befavorial generative research.

The alternative possibilitythat athludes right be influenced by our genetic makeupissemed ico tarteched to searant sensus consideration. Yet that her-

### "We agree on of hings," says Mark Newman (at left). He and identical twin Jorry Lovey met for the first time seven years age.

eay is now being invokal by serentate olivering to find a driving statutoria contributor in the value of homs that helds up regardless of whether they are need logarter or apart - twiss forday sizpised by the nearby, concodes thoms (Bouchers, Jr., a psychologet who hends the Nin Anty, pognant at the Livercetty of Minneopa, "No theory is was baget."

"Nature prevails enormously over numeric proclamed the English solerists Bir Francis warmen and the Francis Galton over a contrury ago Modern enveem But by the Eightes. Dateers were But by the Eightes. Dateers from two related lines of research. This IO scows of identical twins evered some were found to have a.7 correlation, meaning that roughly 70 percent of the virultion of 10 m these suital barrie is accounted with genetic variation. Next, many perconality, traits were incom to be under heavy genetic influence. Identical barrisreased apent com-late account 50 percent on the suitable accounted to the suitable accounted

From the heractoment' perspective, this made good sense Genes, they argued, could affect



It is least, any expension and Anotion flower which comparison to least permember 10% example. By partial source and the source with an balance that a chief boor with an balance that a chief boor with an insight find source listical more agreement and thus develop rate a develop and thus develop rate a develop and thus develop rate and thus containsaid to mean the other water and thus develop rate and thus containsaid to mean the action of the other that and the paper by Nochsel Management is a table report by Nochsel Anot estate of Mercical Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Research and Leader Canner of the Nochsel Canner and the Nochsel Ca

#### Additions may not only be learned, they may be leberized.

# MIND

similarity in values that fraincail twins. to reconsider

The investigation aurelysed the antukasi of 44566 km pass in England and Australia. Their questionment of creative control of the test from relagion and set to the iteratment of creative control of the test were deto social of the test were deto social of the test were deto social of the test of the version angle" policies leverrings. The colocoline. Identified here activated their greater attlactnal contents these hereas consisted 75



percention a measure or politicial indication, whereas if alternal twens consistent only 52 percent. Attrudes on 19 eems, ranging from diverce and spatified to computer music demonstrated storig genetic component of transmission. By complicitied only there here showed significant cuttural tensorpation.

Understandardahly, nacical environmentalists have balked at freee claims on the basis of a ingie study that recently their position has erocide with the publication of two more studies tast appear to confirm and extand the 1986 incharge Al Minneada, Sochrad used he solder to object and 31 februral-twin persnerated part Aher company, her sources to a much layer aimher sources to a much layer aimher sources to a much layer aim her sources to a much layer and the sources of the sources relation terms and a much layer her and the sources of the sources her the sources of the sources and the sources of the sources at the sources of the sources of the her the sources of the sources of the sources of difference and near

Scientists find striking carrelation in the views of identical twins that hald up whether the twins were raised separately or tagether.

Inverse mediata al filt of the list hard to order Body amont to explain why calcinataer and different and the propagator personal. Perford the propagator personal, Perford the propagator personal. Perford the depolar all record states or entry to teach submitted and explanation of the personal personal and entry and early states and compare the personality return and compare and record states and contain approximation and record states and contain approximation and record states and contain approximation and record approximation approxi leaved to be under heavy genetic influence-might lind the methometical elegance of Missian Conord Missian Conord Missian Conord Missian Conord Missian Conord Missian Conlexity (Context) and Missian Conlexity Conmetical Science and Missian Desire Context Researchment in and Lades The mesmit filter cell wargens tand to merry reflexiverges and ethologies and Science Index and Science and Science and Missian Constraints and Science and Missian Alexandrow and Science and Science and Missian Constraints and Missian Alexandrow and Science and Missian Alexandrow and Science and Science and Missian Constraints and Missian Alexandrow and Science and Alexandrow Alexandrow and Science and Alexandrow Alexandrow Alexandrow and Alexandrow and Alexandrow and Alexandrow Alexandrow and Alexandrow and Alexandrow and Alexandrow Alexandrow and Alexandrow and Alexandrow and Alexandrow Alexandrow and



causes an attracte chustering withinfamilies and monoses the number of people at the woteness of the papalation. "These first ngs definit mean parents, teachers, and dergy can't infuence loads." In anys. Thi model suggest that they are much less officance in tracementing values then previous ly passamed. 'Co

The Minneeota Genar for Twn and Adoption Research is continuing to recruit terms and help terms regred apent find their co-term if they are searching. For more interneting, coli 612-625-6057.

# ELECTRONIC UNIVERSE

DISC DREAMS:

CD technology finally hits the computer game-market

By Gregg Keizer

Isters to game makers long ensuph and yourd task here have been tell Graft to back score use here and to che card where the here is a state of the state state of the card where the here is the state shows of tomson understate of hours of tomson hundreds of hours of tomtog tampet at tasks shows. All coming to your home competenary vedpoarme machine.

Consular samers sam look forward to a dozzibse array of new games for their CDs, sach as Wess's This time they might be right. Bigger backer games that depend on compact along the same same sized CDs that you shows this your audio system, seem same is how of the shahas

Garnes on CD seems noceoses



7th Goest. Duers will Goolde it They do any more than present mediocre games in a gitzy



ty batter—the disce simply offer more storage space, as much as 1,500 floppes—but the sounds, music, flarmation and images that developers call pack of a CD can make for a noter deeper piece of software.

Some CD genes lock atmoliately aixnering auch at Virgin's 7th Guest (IBM PC) a heumedhouse mystery with elaborate sals, video charactors, and shough cheapy made and board affects make year has been at the formate of or a last rebase. 70 Galaxie of or a last rebase. 70 Galaxie of or or the CDs cost \$100 and play in a CD-ROM conversion to year. For Each to the approved to the state of the conversion of the state of the conversion of the state of the state of the mand least of made or all mand cost of the state of the mand least of made or all mand least of made or all or play time, not yes descript quarks.

Taken's by judge arê the law CD garres elitedy's cell and both the he KG and Materiaan By mityaar only a hardfoll middl is by allows thefted both the second by allows thefted both the second by gares focused over with bits of bound and entements Battaine hundra Whate is more World for Cameras Sandbargo' (BM FG) gate throad as the log CD fail faith for a rad house loading. Whithele Followers Sandbargo' (BM FG) parts throad as the log CD fail faith for a rad house loading. Whithele Followers Sandbargo' (BM FG) Paintonet and the second barries and Paintonets and the second barries and Paintonets and the second barries and Paintonets.

But the PC and Macintosh are just a amali hal on a big dog when it comes to CD games The numbers belong to the declaraed videogeme systems. That is where the CD electronic ortentainment we will be were to be to be.

Turbo Technology is (Tosmerly NELD) Turbolank has had a comperiori CD player for years, and diso tites on game players, perticularly ICOM's Sheetset Holmse Consulting Detective The TurboClestic stall the only we recease deals with a CD add on

The two major players, Sega and Netlando, will duke it out over the next year for top billing on CD. Combar's already stanted for both companies reduced their both companies reduced their base game system—the core of any future CD-equipped compaundor—to SRI bit June. The Begs CD, compand data generalistics control (International et al. cost brain control (Inter Schriften Comprisons ration); alassion. This SMD black book datakin under the SSG Scheme experts water on the Begs CD terrent inouvergr terren and Wignin Begs owards a mutamition color multransfe studies for Colormania owards a mutamition colorm multransfe studies for Colormania transfe studies form.

Netraindo's own GD actively went appear uses 1993 and will probably debut with rower tiles than the Sepa, but repentedly will rowe \$100 kees The delay and magger last may not be meaninghull though ance Ninteractivel undoubleely basis the GD machine with comparison

Other GD inschmen hove for a general the solution in this soci-tolog dubba hardwave mather Philppi CD-1 a VD-leveling box fait communits to your TV, continues to languate as a game player mostly carls on telefalterial and were to takinguate and the solution of t

All lards of CD game hardware may be have out at mound the corne, but what of software? Initial bary out too it may leave the bary out too it may be an any software the cor based on successful controloge games. Semith The Autohaves of WMS Beamster, for instance, will leag hard the PC to the Segle CD and Sparthum Holicitylis wohing on a Star Teet Alexie Generaeration came for the Secie

The game playar sHoly Gral-CD amartamment—Is ready to step out. Let a hope if doesn't met under the lights DO

04 CO.M.

# TOOLS

### FOR THE TWENTY-FIRST CENTURY A coffee-table dinosaur museum you'll never want to leave

By Kelth Ferral







DINOSAURS: A OLOBAL VIEW, Sylves J. Czerkas and Stophen A. Czerkas. Meilard Pross. an imprint of SIBD Promotional Book Company 600 Fifth Auanza. New York, New York, South, Sala as

PLUSES: Congeous, beautifully designed and parted, thorough MINUSES: Head to held poorly distributed, needs o tall bookshof or lease or free failes

VERDICT: Independable, unlikely to became extinct soon.

Feer volumes capture the decito-

ment of directions and their world more besuch/by then this one Handrets of dramatic pantings, drawings, and marvelous scruptures reveal not only the appermises of the chrossians, but diso than twitterments.

That Labrease proved hospitable to the chatarea Dinosaura hoursided for about 140 million years, melong one worklar if that absolute newconter. Homo sope ons, will out newch as long

Authors Sylvin and Stephen Czerkus, along eith their team of artists being to this book the preserration expertise and attprint errate trait errors there denotes a earbitions and determine for mulsearce workdwide. Detolation 4 ditbas likes in fact, may errors you of a wonderfail dimosar hail a reli opstandi musaum whose autibitis jou can wonder at will whenever you wint to whick the mol destanded to other pattors.

It may take some often to find this book, but the effort will be repeed. For anyone who's regretbod having kinsted museum time, Denoseum A Ghoek Wave to a stat volume delentity a kooper DD

The starting world of disessors is beauthufty explored in the Czerkus' lively global guida to the ereal rection.

# STYLE

SUNDAY BEST Protective wear for your day in the sun "

### By Peter Callahan

Falled in Australia shows up at school without a half Harvey Schalooesity says knowingly. They send him home?

This paid the kend of adder that Scholssewicy Scholars by close when decisioning the impositronwhen decisioning the impositrontransport of the scholars of the scholars that proving mercicle collection the scholarsem—consisting of a synwith a branch scholar disclosed scholarsem—SPH Ware according to Scholarsem y thesis is scholar scholarsem—SPH Ware according to Scholarsemy thesis is scholar scholarsem—SPH Ware according Scholarsemy thesis is scholar scholarsem of the scholarsem is scholarsem of the scholarsem is scholarsem of the scholarsem is a variable scholar such become is a variable scholar such become is more scholarsem of the scholarsem is more scholar scholarsem is scholarsem in the scholar scholarsem is scholarsem in the scholar scholarsem is scholarsem in the scholar scholarsem is scholarsem in the scholar scholarsem is scholarsem in the scholar scholarsem is scholarsem in the scholarsem is scholarsem is scholarsem in the scholarsem is scholarsem is scholarsem is scholarsem is scholarsem is sc

Based in Chroap, ben valewing Soler Proceeds Factory or datases winhits shorts program suits, French Foreign Lagonetyle have been things emploit bemain for noise blackwedy and paint for noise blackwedy and a basen obsequery. While service a basen obsequery While service a basen obsequery with end and the base based of gendering. Schalkwedy's manning with traditional bases baseling on basis for gathers, baseling, no service base bases and part of the base and the base of part of the baseling base of the base base of the baseling people in basis to colors because people and base base of the other base base people them base like or more not

While SPF Ware and the only product on the market designed to block ultravolet mypescottasida-based Fragaian has been making protective oldrhag, mostly watermean. On three years—Schalowsky claims ris norship watermean. On three years—Schalowsky claims ris heated and light involution to protocol to ownyoky summer wat. The queeton is can you beet in m?"

he product to compete with regular clofting it also has to be competitively priced. "People wont pay a premum for products that are protective, so if has to be affordable? Still, it bothers have that a consumer in gift choose a rotaprotective here or har if e. "Why would any body buy a negular hat that may let in 50 percent of the hing they know causes cancer when they could buy a \$16 har.

All this talk about detring and concervour equip excluding that in ternstool. Both skowsky, a flaw years ago. This combody told mistica of the setting hats that block uttrain offst fight. I would versially focus nexts: "A native of Choogo. Bohwioweky worked in the manlisting of communer allectore.

When a colleague developed skie cartuer, Schalowsky became concernes, Aller has hered bid him that one method of prevertion was to weer protective coliting, Schakowsky asked "what hough was a very stagfrieward taximiter—What is the deinition of protective clothing?and he clich I know He asked he dermatologist and he dickt know it knot of made me rufs."

Back home in Chicage Schedwards begin hairing faith not to see what level of protoction flevy offered Begrinng with a traditional cotion. Feitht, Schedwards was suppresed to perone of URP may although a pertoget of URP may. Alt has bort, type, why don't with 1 such they, why don't with 1 such they, why don't with 1 such they, why don't and that is corriforiable and affordable and that we can have manner listics to black mety-area porcert?"

There is a strong party west bothth the bag range (both above), the debag range (both above), the debag range (both above), the debag (both above), and use colorer thread on rylon, the debag above and a the ends collar. He brought in Terry Boses a colorustie of Merris Calyears and a hait of toloring, they parts above.

Since then, they we contracted whaters and catalog companies, and terms established as BOD numban. They via received "focusiende of calis". Socializational with yars, many from grafeful outcomers, who we long basin searching between means of protecting themselves from the sen.

If Schalowelky had He with, he says, all kids on Little League hears and at socior campe would be protected by SPF Wear He'd also fet to see the day when all metufactures tell people what lived of protection ther coloring offers

Schulewsky with interested in becoming just another fishing company trying to keep up with the latest trend. What I don't wart," Schakowsky says, "to to be in the first barrows (20)



San suits: These cicebes keep cancer-causing ultravialet A and B rays at keep



CONTINUUM

COLUMBUS' OTHER LEGACY: The explorer's first stop has become more Third World than New World. Plus, horses in shades, and straw in plastic

Critics of ourself Columbus quincentenary celebratoria, who ale the destruction of matree ecology and culture broaght about by the influe of inpaceus. Europeans, need look no further for proof of their contenions then the cale sample of Sam Selvestor in the Biotennestratisticantial technology to the New Wend in 1462

One would have expected San Salvador to have beneffect substantially from the revenence belitting such an historic landmark—especial-



San Selvador: Quisconteanial victim

Instance and charactering boots yes (50) years Au contracter. The vasion making a prigmage to discover San Selvador for the first time is in fair is shock. What began as a vendricover revelation for Columitsus and his crear has turned into islater day registrates for the timy occution interaction brief and the capacity.

Sen Selvedor west once a besuitful windard also covered in dense fordet and beering with weldels. Bit organis in table tatts, peaced to Ucogen Antwell Inden Tim Columbus de softeed is "hendly and well dependenced," were canned of to in early death working the Spanish poly million in Hein

San Shevish's tool on before under this new columnal mass and the list of the second base of the productive for deal to based at rogs and second the infribut, and is prioritic of the based at rogs and second the infribut, and any second transformed and the new productivity. All can all deal important to the advance of the second test of the count of the second and is new productions. Happed and all of the second and is new productions. Happed count of the second and the new productions are second and the second at the second at the second at the advance of the second at the second at the second at the advance of the second at the second a

480 URB interpretation of the table of the second secon

What little chance the island had of earning tourist dollars

was restricted to inary two decades until the site 1965, bestause the presence of Used States anal and meele-tracking bases made the adard of theraits to all ecoppt initiaty personnel and local residents. The navel base a now is obligar for Ameters studying environmental scences, these are no Britanian subards. It straid, local perform the mensi takes other capter spread base of the few carser opportuntion on the sider of

Like the island s providus administrators the Baham-

An government has done this to narray the sound situation on legacy or attimutes in economy. Most of the merger land, marks and histopical stratectors—the stone onse execute at the spot where Columbus landed and this local massum are the nare to the treakers work of one women. Jocal Colembus hardware Ruth Watch

Chief new in 1960, are the detail auditmicibility hashing foring to evaluation a live charge transmission to cool in a subscription of the subscription of the subscription of a license interview long, a cardier evaluation and a continuous has been subscription and the subscription of the subscription of the first Bais Solvadox Instances that measure will be no repeated of them in a to cold installs in shards the firstnormality of the Solvadox are both a notice and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both a notice of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of and instrument of Bais Solvadox are both an above of an above of and instrument of Bais Solvadox are both an above of a

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# CONTINU



# ARE YOU A POTATO-

with neuroph moles who favor ers, or futy stocky, Extraord Surface Annie

Linewsity of Adelaide praducapitols likestides attitudes.

The ownalts save surprispersonality is much more

The strongest association called "locus of portrol masters of their destry.

So what rises this moan at

hough promotion carriestone. -Leigh Dayton

#### AND TO THE RIGH OF THE AIRCRAFT IS A VORTEX ....

Accelaries offents usually closel control. Now and neers at

Woos are ust about as cond as they're gang to instead of swing to alter wing THE AVERAGE HUMAN BREATHES 5,000 GALLONS OF AR A DAY, WHICH COMES OUT TO 13 MILLION CUBIC FEET OF AR A LIFETIME

THE WORLD'S OCEANS CONTAIN AROUND 496,370,000 CUBIC MALES OF WATER

design to describe powritally desertation ward gamai, the company has turned to NMAN soft moting developed in the toghnes, teating small turning redges of the wrights "The shrone backs and as a flow straightenet," Linton says. "They develop the Serration of the apprang vertices and convert in the remain activities flow behind the anglane way".

The lightweight subines middle of alumnium or graditie composities, are mounted parallel to the deextern of light and have out diag by as much as 50 perfort in wind-furnel lasts and hale consultated with small, single-organe plance. Trefu no small achievement in a bait where anoneers count themselves lucky to reduce drag by tenths of a percent by reconfiguring wing design

While Bardstand to break on be locked in place. Latter easy allowing them to agen might yeak a side boards: Connecting them to electrical generations occur hermess the homesoner produced by the swing versions. If Justice Locked and large encode, the Barty Tatto, produce combine could even large another. It is the barty power electrical, presumes, and hydroale options: The information another two years —Garows Politices.

"There is no fortress so strong that money cennot take 2 " —Corea



NASA technology helps aroush beat dangerous what speaks

#### NEXT THEY'LL BE WEARING SUNGLASSES

The next time you see a beeutiful Arabian station pranting around a phow arona, look closely at his eyes. The judges will be

In noord ywain, should heran barrens have come up when well well that per man or performance and the second second performance and the second revend They Hill be attantiate which contain tenses. But these horses don't improve the horses well here and horse welling that bards and results and here any barrens and the horse second the results in a more direct lock.

The balance may be model both the American Horse Shows Association and the American Quarter Horse Association have nuice on their books that prohibit "afficial appleances" on a books that prohibit band or cosmerically unappailing eye. Nother organization has discualified a dentestant for wearing contabl lensais, although they we received complaints.

Benneti mases the case



Teant conhests Baky bostiness

that an 'writeed appliercor' could be interpreted to mean perts of a horse's bridle or even this note: In any case, gotting date lenses set the worth thing that could happen to a horse, he controls Bone transmiss put hot soci of organ on a hotsers rectum to make hes info or put – Pooer Numment

RAIN IS GOOD FOR WICKER LAWN FURNI-TURE WICKER LASTS LONGER IF IT GETS WET NOW AND THEN,

MARRIED WOMEN ARE MORE LIKELY TO FOOL AROUND THAN MARRIED MEN.



# CONTINUUM

### HOT CHOCOLATE

Chooselete may never again meit in your hand missaad ol your modih it Pennsylvenia Base University measachan'i have their way They vo isolated a component of chooseles with a mailing point significantly higher than the tempershare at which the deloavy usually tarris to a stocky meas

Coose builtri, the most experises and constraint experises and constraint experises and a mething boot on status, body temperatures repaints Paul Dimets, proteasor of local operators at the university. The builder, see tracked from the coose boots, quest chronobles and alternaoral boat in this modit. Note Denke and the prediative shoters i new identified once builders new identified with a methog point of 165%. The being one of Hing ample pleakups, choice and market pleakups, choice and market pleakups, choice and heatanness angan facin the market pleakups and could choice and could be carried and werner and could claims pleakanness and could claims and under an and could claims and an and could be could be whole all the crystalls with heat bolymers and could be the crystalls with board heat heat bolymers and could be an and could be constants and claims and could be an and the could be crystalls with the could be could be an and the cou

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> it may soon be harder to make a goory phoceate mess



Syne for any of holder is accertition

### SPINNING STRAW

Acto reendentines reveauer burrpars out of sistent Thoegloss, and cliest secretary's fitney restantis. They remote as well make them out of straw, in. The year of some burgaments. And they may soon do usy finet

Recoverant will him Lawseing of Anth Walast Lawseing of Anth Walast Lawseing of Anthon Herits Storg a comparison in the storg a comparison of the store of the store in the store of the store of the store of the store in the store of the store will be stored wall be store will be stored wall be stored will be stored will be stored will be stored will be stored in the store of the store of the stored of the store of the store stored of the store of the store of the stored of the store of the stor while isolated with our fibers we have a more teacily exclused framounemional plane costbon. And hug can be produced for had the cost of glass med having in another the price carbon fiber. The adds As an added advertage, the energy candidat of compostios can ever music the cost of the product record na

To data Better and her colleagues have found low valuatio components in theme were polyacithmise (a class of natural attraction) and and and attraction of the second attraction of the second peoplement plant to autural peoplement plant to autural bects of the components. The oran use plants and bectars with the compotensive and the component have appeded to minimate have appeded to minimat



# CONTINUUM



### HIGH-TECH LULLABY

When Regar Warnelfs appendixed mixed can adbe in actual of invalue can be be in actual of invalue can be be invalue of invalue of the heat of the actual of invalue of the pendican be actual of the actual ward to be invalue of the actual when the actual of the actual when the actual of the actual when the invalue of the actual when the actual of the actual of the actual when the actual of the actual of the actual when the actual of the actual of the actual when the actual of the actual of the actual when the actual of the actual of the actual when the actual of the actual of the actual of the actual when the actual of the actual of the actual of the actual when the actual of the actual of the actual of the actual when the actual of the a

"Research has shown that

In the tapes to be effective a balary must be introduced of at before the or eths is an weeks and: any entropy firman "sectionology Group prepent manager Christia Meshall". It has complex sound patherin and the human spetienta any distance for the lock, calan dataper, or medical abarton that a orying below might need.

At Cryses, a help the for dataught parents of exceeds ing babees, national coordneor June Jordan says the large detril and for her her

#### N ZYREN GEAR

TSUNAWS, ALSO CALLED TDAL WAYES, CAN REACH SPEEDS EXCLEDING 500 MILES PER HOUR

UNTE 1890, WITCAN CHOIRBOYS WERE CASTRATED TO KUEP THER VOICES FROM DEEPENING

admits it has done wonders for other families. Some mothers are adds, swaar by the tranquitiong hum of a wacuum cleaner

# FROM THE BEACH

Researchers of the University of Michigan Inare discovered a simple, interpersive method of cervariing corrent basin fand into silicon-conteining compounds the justimation of have a watery of more compounds the justimation operand who electrically constructive polyment line may eventually builded in such products as hostoble cer winderheids

Borne of the polyner derivatives developed by Refrect Laine and he colonaguae, reducing China backer Vinity of the University of Weithington, and I aud the Baud crystals Jourd in drystal watches Others decomposes to Celefon decomposes to company of the result regarding on the feet the regarding on the feet the regarding on the feet the regarding on the rew composition graph of the rew composition graph of the rew composition there five chemical bonds to skicht natead of the four found in most allicon polymers

"The conversion processo is not de ampli-net, could any de ampli-net any de ampli-net, and any any de ampli-net, besting a collision of any de ampli-net possery white, operating and emore a water the state and emore any de and emore any de possery white, operating and emore any de possery white, operating and emore any de and emore any de and emore any de any de

blaach sand has the needed storodiants for new polymers



# D A N I E L S GRAND TOUR DISASTER IN TIME

THEY CAME TO WATCH HIS WORLD BE DESTROYED.

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Street Date: 11/4/92

# n Earth Aslt Is



ARTICLE BY CARL SAGAN AND ANN DRITYAN For the forming of the earth they said

"Earth." It arose suddenly, just like a cloud. like a mist, now forming. unfolding ....

Popol Vuh: The Mayan

HELMIT WIMMER

T onling lives forgver, in arryone to record the

swifty collegend upthe central mass crow

stances of its orcen. worlds milling about some at creat distance



and incomplete althe Earth radiance, a sustained are forming has fallen calacto moldondead red giant star cesses of the cloud to excelled from the see what wonders are amognhous of a carbon-och star in calactic sector, and making by a mobily baller wars after the inc, these very Norra

Our abory begins pullulating damly dumprated day. The story things gone just a little



of gas and dust can transmuting hydrogen centures deep inade now only as \$10 more-within great dark larses, free of

that are about as

differently, the story of older-but we are still from huge clouds of their adolescence, but are initialed When it

forth great gales of

accumulating and cosgalaxy, vest, mecular collepsing under their

up through the simple haps a hundred solar As the dust settles different orbits. Paterrity you writch Ages pass With so many bodies moving worlds collegit. As you look more clocky, you can be collision accurmg atmat warrywteen. The Schräger ten begins and almost urmagnable vicence. Sometimes the collision is atta and head-ou wai a devasiting aithough aixin, explosen beave onthing bit shards make aith many idented bit shards make aith many idented bit shards make aith many idented to, the botten sock together and a low re, durible worldig manues.

In another agin or line', you refuse that anvent must large boths using a forth and another than the set of the set and set of the s trigid interstellar dark. Only a few are in fortunate orbits, reafter easen, nor pulvenzed, nor find, nor excled. They continue to prov.

Baynor al content mass, the bogan works are attracting not put due to the work and an attracting not put due to the work have attracting and an attracting and an attracting and attracting and heat start and attracting and attracting and attracting and attracting and heat start and heat start attracting attracting and heat start attracting attracting attracting and attracting attracting at a start attraction at tracting at a put attracting attracting attracting a

Clear m, where the date gas has by now bear cleared news, come of the worlds are become (Sarh-lab parkets, another clear of surveors in the game discust antificially, gravestored nolete. The treat accumulation of the labmition years, about as long compared to the Mission of the Solar Dystem as



the frat rane months is teletive to the lifetime of an average human being. A doughnut-shaped zone of millions of recisy, metallise and organic worldets, the asteroid bait, survives. Tillions of kay worldets, the comets, clawly and the cutarmost planet.

The principal bodies of the Solar Syssam have now formed. Surjight poushicidan is transporter, neety dust-free interplanetary space, average and a mateging the works. They contribue to course and carreen about the Sun But look more elsewly atill and you can make out that further change is being worked.

These of these series you remet you have been been been as the series of the series of

The role describing does to matime choice an at the statistical edition of the statistical and the edition of the statistical and the statistical in an operation of the statistical statistical statistical edition of the statistical statistical statistical polymeria statistical statistica

You sateled with a chaotic, irregular cloud of pasterid dust, turnising and contracting in the interseliar right. You ordod with an ologars, gravel-like todier system, brightly itaministed, the individual planets neatly spaced out one from another, everything uninitial files clockwork.

# It's time to take the next step.

Exploration has always opened avenues of commerce for humanity. In the future, these avenues will stretch from the highlands of the Moon, to the plains of Mars.

First, pathways are mapped. Then, outposts are esablished that are followed by a natural information where settlements become the building blocks of an expanding economy. Our international neighbors understand this well. Today, more than a dozen countries are investing in space exploration, fally aware of the future economic dividends.

Amenca could lead the GENERAL DYNAMICS way assis, if we act now Sever System Datase OTH'T JUST QUALIFY, QUANTIFY, SLAW SOME BODD, SPRET HE BOD, SPRET HE RET, SRACK IT OUT OF THE PARK. FROM THIS NUMERY ON, ANYTHING GUES. RULING OUT GAMENTON, THE CHILLIC OF GAME IS TOJING.

CASIO



and in Proton (1000 1810, Passe hand had





.....

The planets are notify separated, you salate, because those that aron't are gone.

The story to use why correl of beam interpretation of the parameters of the parameters of the control of the parameters of the parameters of the control of the alternative regardheast that consist action and control is and the control of the and control is and the control of the

Our Earth was born in such orcumtwok of a as placedly emerging into suplight from its catastrophic prioring There was no moment in which collceased entirely Even today objects from apace run into the Earth or the recent collisions with asteroids and comsynning water lava flows, mountain buildng, piele tectorics. The very ancient oraters have variated. The Moon though, wears no makeup. When we ters, pied one on top of the other. The ex of the Moon to the Earth and deterto reconstruct the chronology of crater-Not just occasional amail impacts, but massive, stupefying, apocatyptic collfaces of nearby worlds

By now in the Solar System has been sweptrive of almost all the rogue workiets. There is a handful of small exterouts the come main the Earth but the chance that any of the bagger once will he our barned soon is small A few comets wat our part of the Solar System from there is datant hormatind. Our there they are occasionally usated by a present plane or a neerby, material and worklets concess careering into the inner Solar System. These days though to control the the Earth way rank.

In every easy to thirk of Link to solve of hom the German, a well authors work munding its own business. In forci, the history and field our packet found, scrubbly thereaded, through hom in the basis of a single to year and on the basis of a single to years out here to access, our cleates the business picose of the, biological mantion, the manuer and inclusion of spaces, the pace and tempo of the working of the a carrol to surp of the working of the activity business of the single for any tempo of the the single for the solution of the activity business of the solution of the activity business of the solution of the same to busine the manual of the working of the same the scheme home more activities of the same to business of the same to business of the same the scheme home home business of the

The matter that makes up our world came together is the sive. Boomous quantities of organic matter fail to Earth, or were generated by unlight. Crool begun, file mutated and adapt of to a charging reintformed, junticelly chiven by matulaten and collections from ourside Today nearly fail file on Earth ruse off energy harvested from the ceasait the

Duit here and open here are not assantic comparison to finding every ustime. Not all of Lar provide mode the same here all provides are used to the same here all provides with a breakers the Larin aid the only barrie recording to the Larin aid the only barrie recording to the Comparison goal, and therefore the ancestor of humans were on the mode of the Comparison goal of the same data of the larin. Ancert Mesoportune on import in the asseme data is no version fully and provides of the say, and data good factor. The only opid of the Ancert Mesoportune of the Experimentation of the say, and the same data is no end data good factor. The only opid of the Ancert Mesoportune and Tarthous and Zampion. The Earry The Duicht Mays (of lend a provides configuration the same data is no constant the same data is no constant to t

That's where we live That's where we come from The sky and the Earth are one DO

This atcle is adopted from the book Shadows of Forgotten Ancestors A Search for Who We Are by Carl Sepan and Ann Dayan (\$23.10). 528 pages) published by Random House.



Designing aliens and alien cultures is wasy it can aven be profesble. Look at ET or the barroom scene in Ster Wars the creature an unusual but not unappeging color, and go Simple, right?

prousive though building their worlds apconting to scientific rules, campally and locately estrupeiating estrutometrial out abing on alien species that is balance ble and self-consistent. Plato a villar. ord matter. That s hard

Al trat glarice the Palo Alto Holiday inn seems on unlikely if attractive, locallon for an energy star with an entraterreatrial infalligence. California hills in stors movie theaters. Ware on Earth.

Not than as uncleased the street where com-

The cast of characters is large, composed of anthropologists, science-totoo waters encoded how sits com puter programmers, psychologistis, and interested aniateurs from waterus propoots of tole playing simulations, dollaring roceties, classroom exercises, and platen of belevable eten outures

CONTACT is the branchid of intel Jm Furners, meruciar of Arthropology at Cabrillo College Over the nine ence. Hagen and Funaro have seen als with sendor inforcets

Understand This is a serious through son offers a definition of thought expersecond. "Mo ciefo I and the creat "I The star system, planet, and biosphere choment here. Biology and biochometry

The aliens depicted on this article's son, Poul Anderson, John Barnes, Elmo, Jane Frank, Jim Funaro, Joel Hagen, Al Harrison, Marphe McMahon flow from planetary physica and peolo

CONNACT revolves around two miles Cultures of the Imagination (CO. Ti) a role-playing simulation whose participents create alien species, and the Bategon Project. The professional ing CONTACT, pertudpation in the Bale-

CONTACTs costocoaco. Po Bateson Project is a nod in the direction of pether months from decoards (plats all arried at the same ounthood. Whet it intellormore? What is culture?

Balsson participants have in past where extransport questions of interstelworlds, cultural dynamics of space colcoles and other inter ruestices all

6Careful consideration of the alien planet's physical characteristics plays an important part in designing believable. self-consistent inhabitants for the world 9

swill as oppasional touches of poetry or trail confightion, a samulated SETI effort will be devoted to departing and interpreting it

in addition to the Beteson Project and COLL CONTACT boatts and anothered at filled with talk, there's late nears work hard to moles contract tercurrent COTI searcise. There are two CO-Zuckeman Both am CONTACT wherans, eager to see where COTI will take

COTI offers the chance to participale on species and to nurture offsoning teams face in essence, a tabula tasa

Unkie meanur COTIs, which mvolved human/alian encounters with each species, this year's cources will dual exclutively with extraterrostnais evolved, rauded nip apage, and into ends Each COTI group will design its appoint to suit planetary specification developed beforehand. At writers or to the not of the conference. The re-

groups each consist of eight to lan memspace issued resulting

Ti world building proceeds under rig const d recommonly prospect rules "COa world near Ziglearman There man

Ether way there are certain provelothe then as hearthers or others. "Our to get there to lift themselves out of with something new

Zuckerman and wan dor Elst stort with a darse attentionhore. The planet

12 CMM

Cipitale—dissipato for an energy CDPformation maniper Dub for an energy Pubcianan D 4 Dennyh and Lanny Neemordshi formati a takina takina takina takina takina terus mana takina takina takina takina atakina terus mana takina takina takina takina mashi atahati itan ca pennay taha Earth homin sa ca pennay taha mashi atahati taha satu bakan taha newasa ukhi masa darawata ata kasi mashi atah ugan her di tahu, hu akmashi atah ugan her di di taha taha ataha tahun ya pato di taha Dibi atahati ataha tahun ya pato di taha Dibi atahati ataha tahun ya pato di taha Dibi atahati ataha tahun ya pato di taha Dibi atahati

We pixed our spoces of the bottim of the simplement with "Jubiantim of the simplement with "Jubianis data doon." From the tesperater, the bearts actively west to create a behearded approximate the provided and during the provided in exponential. "Jubiants reading west of the simplement occlause woundershard parts of the envorommental pressures." I foods, we've a series of the badle period y activrative and feeding strategies. Other and feeding strategies. The simplement of the badle period y activties has badles."

Because Zusterment starm left that the webbe kept levels on Coholia mitgated against sight as a primary serony medium. They chains to powde these beings with an edho-location caing against from the cable world. In the productory optic, they are determine productory optic. Buy are determine productory optic. Buy are determine them in Zusterman service.

Each supportion serves as a hook on which the next development will be hung. There are pitfels to the process trape that, as fearn leader. Zuckennen othernot in aveid

"There is a tendency to went to make your than nearly nearly." To stays, "to hang too many bells and whittles on here "top there to be careful about their Tswindhing is too papeatized, too good at whit is does, you been he restrans are not many peesares for their these are not many peesares for their to do weyting olde. Potietra are what make the opportunity for excluder." CPUIL is at here, any how Zarden.

COTI is all about webution. Zuckerman feels. "We give our participants the chance to think ortically and realistication of the subject of webution."

Evolution proceeds apace on the offor COTI world as well. Yen der Ests prespires are more fecoginatibly. Earthties "then "Zuckerman"s, perhaps because the planet his feem was given is more sensitival in nature. Their planet is in many ways a clone of earth. The van der Elot team annives at a treedweiting marsupial with gracping tigits and sensitive ours. Holernod to at festen "eleginent equintis," they quickly become known as the "Text, in horor of a certain, occasionally elephanisend enger fram Memphis.

Where the Ophelia group focuses on objectibity and environment, the vander Biet beam spends much of its time on questions of social structure and organzation. Gender initiative and organzation. Gender initiatives and organzation. Gender mosternices level to retust make infanticute. Grooming plays a large part in continuncescon. It is unclear how the Ervi will develop a high level of technology.

Even as the COTI aliens take shape, the Baceson Project gets under why A digital message is sent Earthward from another star. There's intelligent We out here Will we prove nonlicent

> Can a culture evolve a high level of technology, including space traval, without warfare as a motivating factor??

shough to interpret the message?

The treat a measure, province got to there as another, and one The count of a dataset and the count of a count of an intern how worked bageties to design a charter worker the todays of measure works in the count of of work that is to of the count of the c

While the COTI groups make delity presentations detailing their progress the Baseson Project holds the interest of CONTACT attendees in more dramatiic federice, through a series of simulared press conferences dessing the /ecepton and attemption translation of a message from snother world. Beteson project participants assume the olas of tolvision reporters, commensates, and government officials including the preeident of the Linead States,

The message arrives setly in the conference. According to "official governmont releases", the message was retercepted by SETI antennae. Actually, it was delivered on dek from one sube in the Holdety min to another. A providenbal press conference—the first of mathies a provinced.

The prose conformers made a darbing degree of versimilitade. Everyone here wants so delegy to make an actuel contact here we fail easily into our roles, becoming the international avaiance, glued to our televisione, hungry for news of the international event.

The president regional network and sector da la service, when not exercise da la service, when not be entropy and the service of the network of the service presents of entropy and compare and the service of the entropy and the service of the entropy and the service of the entropy and the service of the and the service of the service service of the service service

The attent receasing was received at anotherine across the globin, we are teld it has answed from the ganned is received in the certain, of them a venicie headed toward earth from that under. The measure table is belowed to be a black body temperature current may head and the second the second of the second in time system. Therefore, and the second the second temperature of the second temperature (second temperature) and the second temperature of temperature of the second temperature of temperature of temperature temperature of temperature temperature of temperature temp

The alterna' solar system is located in a distant quadrant of the Holdoy inn. Their home planet, a host auto, is filled with computers, reference books, pages of jothed notes and dreanes, were a first base of matching.

Diversioning it all is Kacon Anderson, who displays enormous vegar and enhusiatem despete occasional appears of all but onipping artinities. She is antolute about the intelectual challengui facing alien butletes. "You've coil to be able to think yourself onto their planet," she says. That means assembing all of the nelvere physical colors—gravity." light levels, weather, plant ite—and nporously imagining that affect on the siers and the allen outure.

Fartage must important, the teels, is freeing oneself form traditional indofluxpeen though patients. "Its bad arough to and up with aliens that are just human beings woaring furny masks," die says. It's inexcubable to and up with aliens that are essentially Westermers wearon flower crecks.

To invost noch militärjar, bie Gassen-Proporti allen talen mitt al cogity commonth internats inocqitocut to yao proousing CoNIACT, constrativity relining and Garlyng their akaran. The hand of relicit Andreten, pentraps seatmole torelicit Andreten, pentraps seatmole to de and oppose. Can bai ta throughcut the akar income baieting matorials Andreten is ng/thy osikitariated for workout the object accide the tale tamoughdue to the object accide the tale tamoughnet of the object accidence of the object out all of the object accidence of the object out of the object accidence of the object of the object out of the object of the

The year, for the first time, the Bateson Project is lakeng place online as well as at the physical CONTRCT conference. We interNet, electronic partiction is assured the world car. Telden int on CONTRCT proceedings and other commerciary and casers.

By the second day of CONTACT, the COTI seams are budy showing their spotree up the weakpenary lector is CO-TI, as on earth, cultural accent down to becur without occasanal occenteetherps

Dirk van der Eats leam etminated warfare from the Evils outure reperiore and at lesst temporarily etminated odm from van der Flat's demeaner

1) cerre unguest, "the anthropologist away. "Alkiter in swerp cultural her has always been a motivator leading to cultural change. If you do away with watwhat do you inwe to cirve the species up the technological lacker and into cuter species".

For the EA, the inclivator became population pressure, a conclusion he verse with aome suspicion. Still, a CO-Ti leader's role is moderator, not arbiter if webs, anelly, overpopulation that down the EA apacewing.

Israel Zucksman and crow worked cut some very unusual approaches to cutharal webution. Their challings, to get their echo-locating, proyed upon chalues to an industrial ever imposed some biological assumences.

"We gave our orbatures a waak sente of magnetic orientation," he says, "stronger than in people, yet not as strong as in fish or birds. There was a pull-poil aspect to this "On the publicities, we were despersele to get from a non-competitive sociobyto industrial and then specetight levels. It shuck us that by having our croatase learn to recognize meghteb fields, we'd have a useful hock for putning them towerd an industrial society."

And on the pull inde? We wanted to have come kin. "Zuckernag says. "The creatured" and use of mogratism is to get clurk on it. That final electromagnetic machines serve as conscicutivasiationing divices. It was practical in our containt bat it was into design."

He considers this good advice for potential COTI players. "Go with what's tun for your creatures, as long its the fun fails within the rules of the game."

If A first Baseson or one of processore to croce is hard on Suving processore or and once is hard on Suving processore of the internet of the top of the superinternet of the top of the superland on the opening openied of this stybolk of the opening openied of this stytic "Homory is the cases to be known, is the tail one with four times and a base.)

The obtails and role playing that surrounds the message from Homer's home world has proved as almulating that it is agrood that no further cleanly will be revealed. Further messages will be transmitted for seconding next year. The Batterno Prevent has here a surcess.

This GOV finals corresponded to the starting of the product of the starting of an authority of the starting of the starting of an authority of the starting of the starting of all starting of the starting of t

and whethic commissions and the Van data thread in interventing that the year's COTI excesse resultion in successful methods. These takings says, "during the first a crisiver COtine, contract between humans and shi ans andiai in fallows. The sequencition was that humans are as maker that they can't get slong with anyone elsa. "Then cam't excesses that around with anyone to the contractive Wadden's and the contractive Wadden's and the contractive Wadden's

"Then came Gorbschev Sudden we had a CONTACT that worked."

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ACCIVILIANSON VENUS ASPORTO HUNTS THE RAREST GAME IN THE STORE STSTEM

> PAINTING BY TSUNEO SANDA

his way of orabbing her arm as if he caunad hos

One day I asked why she'd come.

"Not to find the fireworn ' She journed. "I'm another unbeliever, but Frankin beated til I made this clazy back with proof. I've promised to mar-

her eyes puzzled me, and I nerved my nell to ack if she really feit board by the

"Of course " She nocided very firm-N "I keep my word."

That built had also user all outrant wheel and I thought she liked me. about Frankis

"Hard to say," Her voice was senous. "Car fails www.honed.together.when we white kacle. There always planned for us used to think Liowed htm.

She was draw with sweet and priv from the exercise a lying dream. Her vivid face turned grave with what shill was mealing. 'Franke had a dog named Star A bec, white Great Pyreneos, henver than he was Baucht to he a welching but no good by that he cause he warred to shake hands with run him down. Couldn't stop crying 1

She looked hard at me, slowly nodding. 'I know his problems I guess I

She didn't say why till we were cut of the churn, cooking of on a bench. Clanong at me again, she must have

"Termine" The neglitical schools, remove being 'Our fathers were partners They came home herpes. I they Frankman did. He feels a desperate need to

"And you came along as his person-

The set electric " I literated have recorded smin A moment passed before she necols call it the matter of demonds

Her perfect face grew graver.

The level there in my dreams ever ance my table used to brig about how a seisme zone A bad quake shook. them up and knocked out Mr Kerst. Mr he got lost He's always claimed a fireworm came out of the rocks and Her laugh was always music. course he was out of his head."

velling at the door 1 set there to 1 was where a me door real more in read and hoping desperately that he didn't

When we were highlight treated Venose cone to see the planet Blazing blue-white against black space ahead. bright it dezzled me.

The more on start's Meriden white-

6The vid screens gave us a sudden nanorama of Venue-a hersh landscape mountain masses, bare volcanio peaks, and dark lava flows.

"Because all you see is the clouds ground # " Cable was prother veterary of Messar, his footburnt in collect the crior of Rawlore, his bare head as bald, his yoon' cords as badly scened.

Those clouds grow more prelived day by day, as knet as the goddess the placet was parent for but they changed as we dived into them in each besking mode. Darkened to a glootty, herearching model that were but selfs and age shows and alive with hothers

Turburence rocked the shan "I we them. The vid edreens gave us a sudden panotama of Waxua horself, no moldens at all A bareb landscape of uptrust mountain messes bere volcanto perfer, and dark level fows, it lobed

"Hellsh, if you like" Calife shrupped at its suite face. "But we call llares the mother of diamonds Their growth takes heat and high pressure Hore we've got em both

Dismonds form in universit mines, he

mond Dive---and ready divid on the I brid us Gatting them out had been a

Howy again, all of us staggering a a Fire named Kallio, a slow-socker ofare characterized like all the shall with

He came to take us off in a creater a huge machine that lumbered on Calerrollar tracks and radiated waste heat

caught his breath, stunned when he many how and then been in the bast

"I word a forword " I waithed Kalin's incis of startied stabeled. "The first face hundlines with politiciants. "Fun

Kalko apmentaneti n tene ituri Frankin was a Karel .

"Yes sir" I saw him swallow "Of course, sy " He menaned a fun, dark one "Though five revul seen one six ally the event Beally, are it wouldn't

ind Possi reports, None confermation

companying the my latter. Baland geinvited shoreby at Marylan. "I name to conch a concernen and take d home !

"Fin herable centure run" him ert on a crewlet thu can do that the to.

Very good, set ' Reluctantly, Kellynews up "Wit I do what we can

Showing up around light a took up evaluer into the indicat dome. We saw comme observ red with waste heat

### ADDERTREMENT **Outdoor Optics** A Binocular View

From October 1, 1992 through December 31, 1992 through Offering an Aspects® Birdfeeder (\$22.50 netal value) and hittleading tips FREE with the parchas, of any new Ndon hirocolar, spotting

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Monvenience is important for cer-

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The or the Albert Standberry Plan need Take a closer bolk to your Nikan StayForus Phys will be



from the cooling systems. The relocid ther out-demoks and garlines and vazon of black volcanic corea and that anary velow sky where endless light-

'll does look internal." Kates annued when we shrank from that lunit closen. But the lades like our date manda So, ol course, do the electron-

When there? Mercian mediated at a great black pie of rubble and tarobist stood "What happened?"

the cutting rim."

Not mally air, of cruster, but a murcause saturated with sultanciacid and division by that terrific pressure. Mothing,

"Oh!" Mariden shivered. "It must have been depended

for." Notwing changed his dark poker Karst brod a fire more to reclem the many. This was when I came cut?

us Bettere we could sap it a sharp with nowhere to go. Frankie sat staring

"Nothing unusual." He shrugged "Ve day and learn not to mind law."

Learner & races While Learner rechtlicht one "You know we're in a searrin bell Oth with surface rock formations front and

and he seemed appalled when Mender

arm Tester wat here at the mine."

"I'm with Mr. Karst."

"Bert Mass-" Casperg for her furrowed he ne-burnt face. "The crawler's happen here. Reely, you'd be safer on

"Lwant to see a feaworn, if they do

"They don't" He planced to app showed the squat black bulk of the gravit des, you'll be cooked in no time. Be-

"Bo well be the demons." His

I followed her through the bears

look being blac "The mochanin had double her arm. "Said knows

man was burnt black and withingit to curpak, and i now him try in plitte a much He had been too loro on the

planeted transit Frankis and bert closor to hot baarsely whippering. We word he he had he surprise 140

ward to soul

the bottom of a vast cirli-remark basin. an old calders the dreer said. We heart of Aptrodite Terra

The crawlet was a clumpy steel colning to ner goats. The nuclear engine and almost neurolase, but the cases whened and howled. The totel stark The ay had a shern het sulture boy I us and tranzing us again. Feoret for the

Out on the baset one were still in

India range. Franke made the other shop to bit me and a holovid las back to our Menhatian office. I got hen set ang at he wheel hermining for the lens while he posses through the shall us the task desclation alread and described the craster and the capture gain and his plane for the hunt.

"I'll be back with the first trophy worm," he promised "Stay funed!"

Beyond the mix we followed has map forther west, climbing through tangled hummodes of ancient laws into a parble of newer flows and laws octas. A disstrat day, as we counted human hours. That foreboding sky never changed, bocuse the day of kinna is molece, even forcer than fix year

The driver kept hinting unwaity, the beauty at an earlier from some undecovered microscopic leek that might grow larger. The microscopic leek that might petitier but frankle lad grown emroet larable, scanning his map and learning the entry frankle lad grown emroet larable, scanning his map and learning been through the all and of larable promot and lead his was beat. Freektics the wheel harmet!

Trying to look peet him 1 caught gimpass of rough, black alffe, aucide boulders, and ywwing lass tubes that looked wide mough to easily us tubes that looked wide mough to easily a diver boom hint that anything how had any hint the hint of the seat boside me, her hand on my shoulder.

"I see #1 see # Welman guick" The gears clashed and shneked "I saw #"

He moved us surces that wilderness of ontunod score baltioning us with neckless turches and collisions, until at last he stoppied the crawler and beckoned me book to the screen.

"I saw it right here." He ponted at a jut of black basit with a namow scar access 4. "A shiring thing that stid who the plift Get the spot."

I shot the festine and the larkse

"A real feeworm?" Menden was still the skiepte: "Or put a lightning stroke?" You hear odd leports of ball lightning-

Tight" He antied. "Lightning 5 only in the clouds. This arts too dense for lightning on the surface."

Who says? Her impish lough became a weatry yearn. Let's take a breek

He let us take the acresk The mechanic to heated five of the preparative masks the mmers ate and we stept a few hours in our away, the mechanic short ing and yetting in some tormented dream Transe weie us to soon, short ing for coffee. Mandan heads the mechanic brew a fresh sin Transie dream the ring and spread his map.

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### again and drove us on

Late that day we came out on a wide, block plan, that the driver exist we have been as the second randher calciars. Facilies and he drived no there werns there because all the reported agrineing had been in receiver country. He took book the where to noth us across twos hall askee when their her well. "Vertice! Now?"

Pairing over his shoulder, I saw the worm carwing sheed of us. Nothing I's over meaning closer to a sinske than a worm, it shone live a tim tongue of yellow tame, or perfuse a weip of bight yellow and blow across that ho can taxe soa. It seemed tranks, darting back and forth inteed of the clowler.

"Caralici, Franki" Menden stated past me "Don't run it down?" "Veil it vetman?" He jonored her

"Get # vidman\* he ignored her

He leased to let me shoet through the shoet I get maybe live minutes of a before he was yoing in my est

"Enough! It is looking for a trale. The got to train it now. Get the action "

Librariad away to get http://mgithecognure.goi.res/en.tbiologi.mgitheraginer.goi.res/en.tbiolrig through the shaked again, I charght and express the womit in bagit the mainexisting read anyong the a shake such travisio closed the net around it and tighterand a catche to put I. All the ground, up toward the muzzle of the bino cut-

The criver was still groggy from sleep, rubbing his eyes and muttering curses of started dispeted the mechanic rummaged in his tool box and wrand a dop opend bytes hook

He stopped because nobody was katerend

"Frank! Frank!" Menden was pale and breethess creming is assumed in sous cry cut through the where of the goars. "It's alive! Frightened! Helpless!" She cought his arm. "Don't you remainber Star?"

Rigid for an instant, he turned to blink at her and swung back to yell at me, "Velmani Get he batte!"

Gloss up, the worm looked Hw yelet ins demong and glosen gaptan with some pulsing decays. It seemed half transparent, with Nacka of bloss spin faulting and warshing under the alignment of a skin. Its next of the councel skin binestrownees had been and the set work of the set of the seemed to per like tripflened wyer.

"Please Frank! Please! If you love

No.

He protest ended in a breathless gap. I heric he worth had winned its long aspent shape in an effort to take to treadom, built Farriee was pulling a lawer that wound his cables in and control at typer. The five-yead noise control at again, and shapi fighting the meshes till finance public of and built ton on his capture machine. I writed and worth tho

"A tigh-voltage jot," he told me. "to teach it who is in control. He turned to gran at Mandan. "Of ocurse I love you, Marry, buil the freeworm means more than the dog over did. Eve got it recorded on tape and safe in the net. So what do you think?"

"I think you've burt it " Her face looked tight and pale. "Maybe killed it "

"No matter "He swung to nod at his ceptive. You saw me take it Dead or alive, it wins our wager Nom will go cra-

The crawler stalled on the ridge The engine died. The lights went out I saw the driver scrabbling at the controls They were useless.

zy, esting up a scorety welding 1 can see the skepton eeting crow. And my name's made?"

She glasced signify at me 1 wondered what she feit, but her more

The period of the second secon

He bought the captured creature must be an infant

"Estar smaller than the one I saw disting into that feature. Which is probably my good luck. A mature spectmen might have been guick anough or smart enough to gail seek?"

He tarred the cravier around and we pited back lowerd Diamond Drive He made me keep my camera on the captrue as iong as I could stay awake. It made a pathetic little huddle, helpiese in the net and lossed back and forth beneath the gun barrel as the crawler luched is yellow glow was lading slowty and Loucht no movement

"Poor baby" Menden stood behind me, her hand on my shoulder "It must be suffering "

Frankie ordened her impatiently beek to her sealt, but when I got too gropcy to sur the camera her notered an apobgy and its her take if I must have slept the need i knew I tay sprewfort in the tells.

"What hap--' Frankse was yelling at the driver. "What the holl."

Where eller, say The driver turned to gen at hem impublication only had conceated "Just another minor quase. The price, you might tery the devil takes for distroncial Cur adamots register a hunding biogoner themose nevery wear."

The clawler was motionials: the howing geam self. The motionic holped me off the floor, saying the queles had almost overturned us. Mendari tookid ataken, but she was soon pouring mugs of that foul coffee. Franke stood a long time staring out through the heat occess.

"Huh?" I monaged not to kaugh. "You thrik they're hitting back?"

"God lenges" The dwar looked startied "Trever thought they were real. But now--"

Menden turned to look through the best sheed and stifled a little cry

"The ptiful imperiance whether Dying 1 think "

"When Parise creations the back with the correst, take that the interaction was described and the take that the take driving of the life inter of the winds of the driving with the take interacting which controlled into Bakks of yellow dust the life factuage the takes and without the life factuage the takes of the life of yellow dust of the take of yellow dust the life factuage the distance in it only would be of house the net same error of the takes of the life of the life of the life of the same error of the life of the life of the life of the takes of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life of the life of the life of the life of the same error of the life o

"That what you wantee" withden was statuten hard at Franke when i turned back from all that remained of the worm, a little patch of anght yellow clust on the old black live. Her face was stift and bitter. "Happy about 17"

"I did get my worm." His narrow chin jutied defiantly. "With tapes to prove it, and you for a wi---"

The crawler shock Theard an appal-

far below a deep-toped moan that swelled into a turnus below and Inst-

I your women are demons- The cinver equated crimin at Frankse, shouling through that dazing roar "Better here on

The shock struck before I got my nto the artie, the mechanic sprawled hand our boands, and and modifier St. ionce shuck us when they elapped, stunring as another shock. Gasping for broath fonison for screening same dragged outselves of the floor

The driver found an aid kit and Monden helped him spray our cubs and cost orden and offered more Franks. turned back to the sheed and stood rig-

him "Liden Tike it. Let's get back to the Dia.

scrape up payolas of the oolden dust mino. Stanng over his shouldar. I triad tween binding lighting flastes that through the heavy an

"Ash!" the closer resned. "Shinane ap."

It grow thicker, till Frankie admitted he was lost. The driver took the wheel through drifts of the loose anh, skickling into hidden pits, cristing into citto it exhausted, but Meriden stayed baada

"Sorry you came?" ahe whappened "Are you?

And we blandored blandly of through that fog of fre-it rain. Now and again the closer weet the ratio. All he got was biasting static till at last he stud we were on the baten rm, back in shortwates street. He streeted for carefor to laten with his boardphones. His black-stubbled face grew grimmer.

"The serve?" Fracise mached for the headout "Let me tak"

The driver shock his head. "Nobody leteoro.

"A moorded message Link on the rerouter to alort us. The segment of was dta Terra before it went out. Heavy



shocks all along the major faults. Lave north of the Diva, already exploding " "A exception?" Eranian's long frame

wrot while "Why?

"They didn't say" The drives shrugged "If you want ny guess, they remember the Lady Jana Probably already taking off on the /shtar Hoping

Warts leaves up-" The monthane

"Wondaring if killing that baby worm made its people angry

heaver fall of ash, a swirling curtain beneford us buder than the screative ing genra. Frankin crouched grant the

The consist shid down a long signed and stated on the ridge boyond. The erring cheri. The holds went rud. Sarlclearly sharrow. that soft risek shard my there only the shareful i save the direct activity

chine an advisori to aportaer mailes, shuthcrowler bart steller as we broad up to circle Al L could see was that saypon sky, sufficienting blockness and lund purnie ketiline

Hitters call & boll-"

Frankie pasped, sagged beck into his must as if stockers Merclan deutrit had control. So had the constant us showly brathtering & soft coolers hate it had the order of the law freedom.

moment we all shuffled forward to til me craitil son the wide basic from sound out being us, ambat-coloned straona sky I found the red-oraword calingor of the mine, the borrie of them the labor thillon the around

Meridan mound closer her list stelluler invited crossil, nor inve watched that transformed sky. As the ash cleared, that uncarny glow revealed an edge, a smooth, bright curve that ran pat above us, cowing all the basin. It shock me with terror "More things." I bread the mechanic

mumur. More than we dreamt of

"Your damn worms? the driver shouted at Frankie, his voice guivering with tenaion. "If they live down in the rocks, what happened to the sky?"

Frankie satinged atlanng up

"Varue" A occuping it out of the mochanic's solerm cruck till he straightaned to wpe his wysis and gabp "Strangel Stranger than we over know Stranger than we humans can know!

reading in power, but in time that antitiming in the sign had shelpered us. Like the hand of God, i thought, spread above us to halt the lightness. Yet of ocurse it was not God. To were beleaved in God. The over twas strepp too much har me, cometing beyond all betief or understanding.

"If we killed their baby -- 'Mendon's hopers groped my hand i Her whaper ded away and came lawrity back. "If they have the power, the power to teach up such a Heson, why should they save us?"

I knew no anower.

The engine slatted when we fired #

again. That glow in the sky lighted our way across that old oakders, back so the mine We found the crew there no we or than we were. Kalko seemed numb with shock.

"Queixes are nothing " He shook his dark-shring head "But this----"

He atoppied to stars at me as if begging for comfor notody could give hits, Something he didn't understand had situt off the power and stopped every machine at the mine Even the cooless. After less than a minute, however, comting had let them start again.

"A few seconds more could have killed us all "

Yet Danned Dike was shi alive, and Kalite was soon trying to bring us up to date. Reado contact with Earth Rad been cut off even before the seame not was lost. Now sitve agent, the nativments here at the Dike showed a few cistant qualities but nothing at di under Achtech is Term.

He took on back to the lookeut dome for a belier view of that neephcelle sky the glow was near the second strangly odgod. He a smooth yellow moon somether one imposed by does the holizons were block based of the domestic forces when block based

"This golden light-clon't you feel t?" Menden arrifled at me, her whaper



hushed with the awe that had louched us at "it makes me feel-grand! The way you imagine a good drink should."

I did have a surpriving sense of relaxed well being, my cuts and bruses no. Ionger parrui Damond Dies seemed sudderly a gleasant picco and high too happy to wondon with we soutback, site is preserved met that table unexpected groups, and site until kellie catled us to breakfast with each table and each of the factor of the table.

"The got the answer? He growed at Fearlise with an air of cheery revel When Mr Karat exceleded the hot gas plane made a gain amole mp, punching through these high authors deude That unusual glow overhead was only natural sunlight breaking through the hole."

"Could be ' Frankis seemed relieved. Thedn't thought of that '

Terrearesel "Pa gas timeschere mittered to Motode and mis ave weiked out "Orthal-ensue. The potterns we went baceg have. Our forma beans wolked to coop with Gart. They reempting the second of the second printle in early gain heating the dasistabilities of the second second second printer in the second second second printer in the second second second printer in the second second second ensurement of the second se

By noon the Wenustan Jaky tookad normal again, those stormy yellow clouds reven accar amou with high fightning, the thunder multipol to a distant number. Kaito attil avented a tritin existed when we met with him at lunch, but he told us that contact with Earth had been reelement.

"If I know what to say---" He scowed across the table at Prantee, befherment in his black-shot www. "Yw got als reports on your yellow dust it has all decayed to very commen molecules, mostly deales and suffeas of iron Evidence of northing---"

"We've got his holowds." Franke jerked his head at mo. "Proof enough." "Somet the write" failes hold him.

"Forget the was," ratio tool nim. "Tawlet a legal and publicity people have advaed him to at on your freecent story. Too controversal to fit our advanteing image of Verusian diamonds as eternal vertices."

Franke was turning pink til Menden touched his arm

"At least were sale "She swung hopehuly to Kallo." So long as we get back home----

"listtarb loading fuel," he assured her "Lifting early forcerow"

"Without me," Frankee said

We all stared at him I thought he'd gone crazy he publied his place away. half his meal unexten, and ast sorubbing that whoy moustache with a lean foreinger. Abruptly he frowned at Me \* riden.

"Merry---" He stopped and guiped, turning pinker "You remember our woger." He stabbed an odd glance et wothe awkward. I hate to be welshing, but I'm net coming home. I must talk to the woma."

"S#7" Kallio looked stunned. "Sr7"

"I must find them." With an air of solerm regret, Pranke shock his head at Menden. "I must ask them..." His kag Adam's apple bobbed up and down 'Ask them to forever me."

"Really se?" Kalko's rusty voice lited urbelisvngly "Do you misgine you'll over find another?"

"Ti keep looking hill do." His namow pw jutted abubbornly. "I want you to baitid me a long-range orawlet equipped and suppled to search at the selective zone".

"Even if you most them, sit, will they ever understand?"

"They'l have to because I killed

Sitting techer down the table, the mechanic shock his head and shrupped at mo. And Franke strength on Versis to hurt another tensorm 1 watched Misnich lass time goodby nod morning betore are went aboard, the Anher 1 think

Fac not too sorry DO

#### CREDITS



DeDit Approach in the Control of The Antico. Jon Team Rest do Sought Studies Wheeley 407-56, VM (587) and 6000 laws it Desc Desders De Cherry at CT



The Chailingers accident is January 1986 marked this end of the American public's law. Their with its on I space program. Since them, the prose has trequently acticized MSA's take of papters in the form of a crisis and in actitic, worthwhile goals for the agency and far the ration to.

decades ago by the 1968 Mational Aeronautos and Space Act that created NASA and by the president's Space Task Group in 1969. Moreover, several blow ribbon committee have nothimed these goals area Chainserv-the National Commission on Seata mest comGur ninstrig kuurdnise. -the sto-year-old shudle and the 30- to 35-year-old fleat of ingendable i ockets -- are based on its old research and development philosophy of the early space program. Pergleuntgly, Congress kneps dahfing derekgenert al the program. National kuench System Itom anisal badgets.

2. Keep turne space-transportniser cancepts in the pipeline is negative thin-summer taunch systems when their technologies mature. This requires only relatively few budget mesanch and protrype programs on conorder such as anothe stage to-exhibit noticets and an-



prehensively in 1956 and the Committee on the Future of the U.S. Spice Program most recently in 1990.

What the spatio-pioprian does not fused is yet anothis taked to satigate. The nation must decide whisher investible to particular the goals already set. If the answer is yet, more our bodders need to get on with it. No do that they inust make these ton key decisions.

 Develop a new tarrity of lepach wheeles basened specifically for operations: low cost, reliable laundhors that can be serviced like commercial arplanes. The specific argument service wheel transporting and services. assummer paper, promoof. Commit drongly to the haman englotative, and paper and order to the paper of the paper of the paper and the paper of the paper inform (then because of the traditional paper of the pap

 Budget very long term national space programs the human implorition of space—on a continuing, an-



It's time to stop setting goals for the space program and start meeting the ones already set. A space policy expert lays out a decisive plan of action. mak base sensel of only to config. Use to and Dicargos to the specific sense mount of the sense of the specific sense mount is mean in consistent with the ground to the specific sense is the all sense the specific sense is the sense of the specific sense is the sense mount of the specific sense is device the sense effects such as the research sense is the specific sense is device the sense is the sense is deviced by the sense is the sense is deviced by the sense is the sense is deviced by the sense is the sense is a sense by the sense is a sense is the sense is a sense is the sense is a sense is the sense is the sense is the sense is a sense is the sense is deviced bits of the metal sense is a sense is the sense is deviced bits of the sense is deviced bits deviced bits of the sense is deviced bits

b Coefficient Programs for comparout space devicement Africuph tax oracits for comparines that investi and the pass aren't early moostery. For other well and the pass aren't early moostery. For investigation of the power means are bread orabot than an adversary, as in mood rabot than an adversary, as in taken and taxets funding general teearant and development, buying after agoing and compose medical for states. trust laws and otherwise encouraging companies to sam together (respectibly in global markets), streamining restrictive regulations, making government fabilities conversionly available to indutry at load, not comparing with private sector supporting U.S. Industry in the international manetables.

B. Rocorace and publicars the interview of high in an environment of a stract advance of high in an environment of a stract advance by human advancements but also programment environment. But also programment environment is but also cost, actenziu, and excupanter (a larves). The nation has compared to but also that the track of the environment is but and the track of the track in the stract and the track of the track in the stract of the stract of the stract in the stract of the stract of the strack in the stract of the stract of the stract produced levels. But the nation straded environment is the stract interview produced levels. But the nation include environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract environment is the stract of the stract of the stract of the stract environment is the stract of the strac

7 Increase substantially the national investment in a space tochnology basis. Tochnology is the "seed corr" that nonstream all space activity. We have allowed its decay starming outing the past live decayes as we con-



true to feed on the technology developed during NASA's every years, and it oritically media is massive repotion of funds and bright young people. Again, the annual budget commitment required for such an endeatory lies well with the rebon's capabilities.

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B Assignts the network government approvem specific states field that location fields that location individual approximation of the state of the states of could oversee repeat reasers and the individual approximation of approximation of the distribution of the states of the states of the distribution of the states of the states of the reasons approximation of approximation of the proximation of could be states of the approximation of the states of the states of the distribution of the states of the states of the distribution of the states of the states of the approximation of the states of the states of the proximation of the states of the states of the proximation of the states of the states of the distribution of the states of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the display the state distribution of the states of the states of the display the state distribution of the states of the states of the states of the display the state distribution of the display the states and the distribution of the states of the states of the states of the states of the display the state distribution of the states of the

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Jerry Grey in director for science and lacknology palicy at the Amarcan Instate of Aeronautics and Aetonesiscs

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by Melanie Menash and Slephon Mills

> The Sci-Fi Channel, execs like Kay Koplovitz (battam) promise, will batdly go



oliter network has dared to go, offering rare classics and madetor-TV films libs Romeweckor Starrisg Robby Benson, "The Sci-Fi Chernal will be began train Sar Takk" foreitol Gowe Haddenbury, creator of the Tokkor serves, activatory board member of the resolution of the extern haboris and all-externed beene-shaton puru "Sar Tak was one shatom "Roddinatory obsarved, "bat this will be twentyfor house, a dwil twill be more

poverhild because you're creating in whole nave cuitual environmen-leise MHV oil for mase." Bon't Reddenberry and fellow 8-ch toard mamber Isaac Aamov deo becete fen channel finskip assauld nom the nation of loction into a rest, visible, violiting telwerk----ristal, Sch-aimanal oblaved the two men in to the great beyond. Phageab by hotstig packet met the fast and same of aluxenhe give youth will and the fast and same of aluxenhe give youth will and to average. Sch-fi smoot becattre is his-been bafore it made an orherd debut

The determining a procession of the second s

But the real point paper as paper to the regime to the the two the Sec in Future is a matual for paremering new technologies. They don't winit to merely report on what to pain do oming they want to employ ploy the -bern HDTk, which is ready to go, to evolving systems lake technologies to be a cleane fibble on the Sec+Fi Commit, singly vice datament R-becetaion whose being the ploy going to data a part of the cleanest Wet the a lawning dot for the technologies.

That's great for the hard-core fans, whom pole number at somewhere around 800,000, but Schiff is groing into 10 million homes at learnch and hopes to escated to 30 million in five years. According to finose in the know, Sohift has its vorugine quilt of in fine calle bits you have served address to place to called bits you have served address to place to called contents who do called a whole the bits, two called contents who do called bits and the the bits of the bits of the bits of the bits of the bits bits of the bits of the bits of the bits of the bits bits of the bits of the bits of the whole bits bits of the bits of the bits of the bits whole bits of bits of the bits of the bits of the bits of the bits of bits of the bits of the bits of the bits of the bits of bits of the bits of the bits of bits and contents of bits of the bits of bits of the bits of the bits of bits of bits of bits of the bits of bits of the bits of bit

Not. expectations with be highly in all camps. Nay Report Instruct, president and CER of the USA Networks, approximations of the constraints of the second to have a specific and second second second second second to have a specific and second productor of The SPA MANIO DANIE Mark Mark and Second productor of The SPA MANIO DANIE Mark Mark and Second productor of The SPA MANIO DANIE Mark Mark and Second productor of The SPA MANIO DANIE Mark Mark and Second Parallello T. Address as no conferenced Lock at Warn ray aut not Deich you separat to see Services on a Locket of the second second second second second on a Locket of the second secon

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Benving the teterate of locih ine 160,000 and the description of the description of the description of these Alexandron of the description of the universe these Alexandron of the description of the universe these Alexandron of the description of the analysis these Alexandron of the description of the analysis and automatic alexandron of the control of alexandron of the description of the analysis the appendix of the description of the analysis and the analysis and the description of the analysis and the analysis and the description of the analysis and the analysis and the description of the description of the analysis of the description of the description of the control of the description of the description of the control of the description of the description of the description of the control of the description of th



a lifetme " According to Kenin, Sci-Fi is to provide, in one place, as much variety and choice in science fotion as it can achieve. "This will allow those of us who were affected by those products of popular cultion to laws acay access to them agrin," he tags

And Anotes Banch, save of use protocol of metrics of metrics and the second se

Vardict from this regular American-Secret Service in tow? "Loved it," says Besch. "Thought it was fabulous."

Portuges it's only poetic justice that the network of supreme adventure was conceived as an anticitie to exerucialing tadium. It was listening to a presentation about some pable-eventures business."

says Ribernsten. "I had a karansom and hought, Verk sommer mend de niemene-facton cabit metwerk"-- seven though the meeting had skeralike/ notmal to gla with the subject. "Who can sky whence come these sperks of gams, but in this cane, the listen came to the subject." Who can sky whence south of capits from selling therway a blacklog of knowhow from running several cabit entitiene and is southet of capits from selling than. Rubernstein and has wate and partner, turine Stives, were southing aquad for a new venue for them.

around for a new venue tor energy and cash.

Rubenistein and Silvers plannad a two-step approach Spend a year researching the viachity of Sci-Fi and another year selling the lidea to cable operust. Not being science-fiction experts, they socuted out possible members for an advisory board Merin Creatiberg, well known to-

ercel-fusion amferigate was lapped ton the encyclopadic involved, "I was way excited about what hey were trying to do: Genetherg align: "Ligging with Mirth; and Lawit bith; their was betterminous potential." Genetherg encouraged Alimov to come on board. "Each was very entrustatific from the start," says Greenberg. "He was intigued by the doubtioning possibilities—of using the channel to pct.



a new generation of lads excited about ecience "Asmov in turn braught pail Podenberry into the fold. "Gene sets our shugging pitting cable camage with So Fi reminded him of his days trying to get Sate Tools in all these straphetics, more the marky restme. NIC theshy bought it was Gene changed his pittin with him to sey heat a would be Wegon Twin in space."

Burnardial by their solar assingly bord to get a controlling all controls of a Salary bord to get addace and MTV, the So-F1 term took to show the theorem and the solar term took to show the solar solar and the solar term took to show the solar solar solar term took to show the solar solar solar solar solar terms to solar solar solar terms to all monotonic solar solar solar terms and monotonic terms to solar solar solar solar terms and the solar solar solar solar solar solar terms and the solar solar solar solar solar solar terms and the solar solar solar solar solar solar terms and terms and terms and terms and the solar solar terms and terms and terms and terms and terms and the terms and terms

the best idees they'd ever heard and were making a major commitment to us, Rubensien easy. Than the floodgates opened. Operations who hadn't derensaud the idee but hadn't bought it officer suid deenly got interested....on one werted to be first, but giventy wented to be second and thrus. Those we have a hundred Operation.

ble operators—which is unheard of for a new chennel—and we're talking mejor playors—Cox Cable, Vacom, Simmons," says a happy Rubenttein

A very immovating phenomenon had been happening as they were getting standal, silvers interpols. "Ward gato out through the estempe-factor is nonwork—a network that is very serious. The tene wrote us lettere and sets is ideas and called cable opentors taking them to put un or, we begin to feel the

"The prospect of encountering a reality onscreen that was nowhere else In one's experience made movies like The Thing memories for a litetime," says VP Kenin, The goal: To much variety in science tiction as is possible.

# NICE WORK IF YOU CAN GET IT

We control togenerg faults: and fails and sense to the sense had pairs and the sense had pairs and the sense had pairs and the sense of the sense to the sense of the LEA National Addition the calls and faster come including at the calls and faster come including the sense and faster come including the sense and sense to the sense down factor. Including and the sense causes "The backet particular like the calls of the back participation of the local records and over a flocation of participation of the call of the sense of the participation."

Ex these were to orderary states of int scentrol: The remarked is quarktray were matched by five valuation. Any spatial is stated to adopt a state or order or the state of the state of the on outcomed the states of the on outcomed the states of the on outcomed the states of the order of the states of the worked on, strain gain to demonstrate process quarks and the states of the process model and the states of the process methy and the states of the process model and the states of the process model and the states of the states of the process model and the states of the states of the process model and the states of the states of the process model and the states of the

Not import of their expects in the nativatbace. The The adversarian of choice strong the source-intern tertifical usacompret togeth together together together together together together together together and the source source and the source of the source tertification adversarial to control, which are adversarial to control, which are taken the occurry-larg an utilizended debelow vir asymptic was to this adversaria adversaria to control, which are taken the occurry-larg an utilizended debelow vir asymptic was to the adversaria to the tertification of provide the source of the tertification provide the adversarial together and the tertification of the source of the tertification of enclosed the tertification of the source of the tertification of enclosed the tertification of the enclosed the enclosed the solection enclosed the enclosed the solection enclosed the tertification of the enclosed the enclosed the solection enclosed the enclosed the enclosed the enclosed the enclosed the enclosed the solection enclosed the enclosed

On a four losing for financial facting Ruberswine and Salves ended up at the officers of Kay Keptivitia at UBA Meanoti, the number-one-rated cable networks, "We looked at Salve into it," Keptivitiz anya 1 had to satisfy most that there was ensugh product to fulfit the expectations that pooling would have of a charmed We that "Take the marketing potential" facets "Take the marketing potential" facets and tringings sailed across Kuthik's disk. Star Test tigurines were tucked in stond with resumes

There does a particular to be part from the second second

sions when Kay called late at night and cald. T don't know if the trag's gome, work. "And laser carrys," of there's any way we can do it, let's do it. If's gome Go work it. "seel it is my banes, this fring is gome be bigger that big? March 30, 1992, the deal was shuck, and the Six is Charved harmen land.

Now that is a core doal very the torm on the plane: a native to say passes to the brain of the brain of the corespind to get a tille work out of a (See 'Noo Wax' show) 'A metaly we have that hexpeription, surgers in the general if its sensering that arons of them correct tempolarity steps". There is no access 'Noo Wax's show 'I want to access 'Noo Wax's show 'I want to access the show of the steps of them correct tempolarity steps 'I them it mere who now the other shows of them of the sense the the them.'

Abby Benchen-actor, Grector, wit-Abby Benchen-actor, Grector, witden stass in the first made for-So-F lim, Nonewecker Bencon sey, "Its probably my Isvothe game Whini I theit back on the troves that I really remember---Dr. Strangelow, 2011--they's science fictor. Bancon seys he's got a sorpt all ready for So-F. What interware me is taking a portrail

err in cardboard sitcustle)—"In be the Production Assesser: "

Finitely of requires here come not in insegment to actualize the Advertised to the Advertised and the Advertised methods and the Advertised and the rest in the Advertised and the Advertised rest and wards to wards for the charnel in advertised and the rest and adtication come train many different backgrounds, can be consider just iterative rests. Executives, marketing, hourment, pages that advertised and inpared and the Advertised and interation come train many different backgrounds, not necessity just iteraance backwards and interation come train many different backgrounds, not necessity just iteratised and the Back iterative and inpared the and the Back iterative to the page of the Back iterative and interative and in-

Pigt row charges are prefy acrosertical agaret learing a yob on So-FX. Katak, saye, "Hearly all of the tapowed positions have been field"mostly by take with among TV expanment. Aquing applicants, however, about problems, kould a continue "That's and the obtain for time year, baseds homey-times a pail acroud the compar, and if the obtained really takes all, these will proteinly to man politions available "Troppe

situation and warping it in such a masner that awarything is spinning in opposite directors, and the automn of some thing so familiar could be frightening . Solid Dear an antidation councers

Both has an ambition, structures, sound baths give the view of the memory must floated-barry prevented. "When you reading a whole new world for viewers has have pass now when they land on the channel's released to the second at the second at the second at the second and the second at the s

They pan barrow the kinet to conset is a number of eagly. Perhaps notset in a number of eagly. Perhaps notcessing the number of eagly the set of a concentration of the set of the

# VIEW FROM THE TOP

Barry Schulman, VP, programming

"Wine going to launch with four original programs, and one program poncept with the working title, Spi-

encol Action revents . The action Spectra, David Markan, and Alaction Spectra, David Markan, and The Oscinoso David Spectra Star-In Intercent - am ET Intercent Intercent - am ET Intercent Intercent - and Spectra Intercent - and Internet - and Internet David Raufert Mysianeeu will surlander Mysianeeu will sur-

zerre phonomena in the world of acence listen and other Earthy oddtes-we call I the Astend Enquesi is exerce toton. The Salarad Show will investigate subjects such as the brain, genetics, befores, medical travits and Al.

"For Boarce Floton News, we have commissioned a hendful of authore to create new works, and wo will satect one write to chryelog a complete workl, a escensy of people and oversa upon which se will base scionce-botton news updates based on the orestade work!

In the first year we also will hum backet new made for 1% moves, and wells percently to have in the adand year. The movies will be wellhunds, will developed, and will ancompassis science fact and factor. The movies will unker outragedge tochnology. Is the time moves, demension waters, strang Bobby Bonchemischeratios and become yearcait

Also, a correction program control of the best of its off infrastration. Thus can of these images developing over time introduction of the send of time prosect. According to Larsh, "Least limvestion" is the name of an AIV show for which Rais close the graph or, and for the Rais close the graph or, and for the send the send of the harapest" - begin provided and according to program of the send time way when a set of the has do time way may be do the has do time way by a last design. The second images - Larsh design. The second image is a failed age. of Rabby's write and child."

TALION SPACE—Lany Ross, producer Steve Feder, executive director Ross '1 believe that sci-b fans are

very monested in space, net only in science-ficker/ kersay film, but also net once fact. The future is reably space as in terms of asence. In the most tain to hverity years, people will go into apace, but they want to "come on board" new, they want to heel kie they're done a new".

Pedal: "Space is oxiding, something that the issues heaty do want but have nover been given romoety, space activities go on today without any

lend of coverage With our use of technology, with our design, we intend to automas and clazzle <sup>3</sup>

Ross "One of our geels is to get our audience involved through con-

tents for coample, contensions will be asked to detage a spacecrist NASA will pooperate with us by designing the speciocities on a computsit. The winner of the opttops will go to NASA where they will fly the cent through a semilated asteroat beit and the coler priorites?

Fader AI the subects we plan to address have already been examined, but we will present

people will understand it and enjoy the experience of learning. We also be personalizes, closet space family

Foder: We are not competing with Nova, Space Age, or PBS. The show will be different.



Did you know that Robert Rodiord goes to all the space launches and first Jerry Brown and John Derver are bio space fans?"

Bos "We're not going to explore the policia of space or the explore mode. We're not going to explore nose. We're looking at the percondtee involved in all appends of spaces september. The whole post of the show as that you'l be able to experence whet it's like be in space, and experence the near flure."

Seament titles include

"Are We Arong? The Baarch for Exta Transition Left" BETI (soo "First Word") is a project landed by the gorerrment in which additional disclosionaltiones amound the addit will try to tack messages that may be coming in from other pack of the galaxy. The show is about the people who are invelved in SETI.

"Space Mystenia" will deive into old and new mystenias — Stonehenge, the pyramids and the delappearance of the dinessure, as well as our tuture

> In space We will also est armine the pole and considthe space plane and the space estion. The apsoe estion. The apsoe estion the valcle that will be us up for the exploration of Mars and other panels—au yoon us and may be approved in the next hat of the wask.

In 'Rock and Roll Spece Videos,' music voace will be used to tell the fistory of spece by putting, say to an Elian

Man The show is an entertainment vehicle—"we're nol providing informat an experiencial lealing. Ross says

used to modify or warp the first image. You can use a rough, grainy texture or a smooth, stack image - you can do a tot of different things."

The got created of the uppring improves of the channel, dialoted by the technics as The Bg Bang, "andlog as the of new things winn beam doing integrating model shots with animation." The Bg Bang creates of the 40-second opening, The Bg Bang Creates of the Change of the creattes of the university with an explosion. Spectrage Bg/Hange owney with all this with an opening bang of the creates of the university with all this spectrage Bg/Hange owney with an owney with all this spectrage bg/Hange owney with all this spectrage bg/Hange owney with all this spectrage bg/Hange owney with an owney with all this spectrage bg/Hange owney with all this spectrage owney with a spectrage owney with all this spectrage bg/Hange owney with all this spectrage owney with a spectrage owney with all this spectrage owney with a gas, tight, and clears flying by, it's vary dramate." According to Lupid, the opening shots include—shot of as in homage to sense before—shot of as in homage to whet is come before, and, as Lupidi says, "whething your appetite for the new channel."

The chicks and deposition of programes alice somewhat unconverticein "In patient the chick of the source of the decision relevant barrier," Beach save "When we get abase that are based on what we already incov, we throw them contract overage to

Ross: We reolly don't know how space technology has affected



# THE BUBBLING UNIVERSE

ARTICLE BY THOMAS R. MCDONOUGH AND DAVID BRIN

Our universe may be just one baby cosmos among many

PHOTOGRAPH BY PETER LIEPKE

A star cless All theses come to an end.

most does no spectandate it excludes bilastics forth. Every ovilization has tred to come form?

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forth to bring about a new re- over the details. One details

Surecuse Liniversity physicial Len Brunker, of Ink follow some of the same patients

aity A new ontre unverse which used to be brushed of course, is a bit more con-The new unantre that is and has lately been taken but this sun, bigger than born is our own

shock weves and rediction come up with its own explathet sunder anything unlucky nation for the destance of exenough to be nearby Brief- intence. Our concepts have by the star outstimes a pai- mathwellform occurring which any, then the appenremant of Earth and sky to the impersputters out. Voracious grav- sonal clockwork machaity clutches the former core, mana of physics. The most collarging the stars bear in. Incost mailing multiward on tsell, faster and last ed by astrophys mets, as er in an instant, the relic is both simple and measureorne writebuilt the adences. The Bit Benci Everything ton el the way to suberunit unions a lease star need. "seart" became a manuf deas too close, the black bole plant black been a triber the online serie of pround unwerse of metter and postwhich formed every star, plan- seech generation some "child seem the most extravapant

So far machanes has over another peometric reason the whatmingly supported this essence of the door old when of the postnic photohas reemerged, bursting though ecentrate and aroun

senously Where did the onginal seed or "unwarrial and

Now a young physicist from Syrapuse University in that also spent time explorupstale New York bas reached a starting conclusion that may expand our spent and, may explain out into west accologies of countless millions of universes. By taking the "egg" metaphor quite inorally professor Lee Sanoin has deduced that our the trents of living things lit. It is a secontrary function of california berrary was to a second horry Strat-Not even white on except in the first fractmentery race. In start, it is probably living steep event horson And ment when a microacopic coartic cops of its own. cohit new from which new uniats, quetly mysible, while supernoves---an expanding live and de. Some of those utrences offsonso will in

winhoral He spends countless hours at Syracuse apmon the laws of quantum pass live years, however he es mont be like oraga sms A uneares must clean ten to a number of new unverses they appoint its indivadual has toru Smola excising "The mechanism of petient selecwhich offopring with the most successful surveysi sitelecles prevert. The whole col-

In a day of weld theoriessee the farthest tearbas of

unswater' wil differ shahily wat Alter el, we can't even generations pass, the universe our own universe the Huben charges form inthe by M- ble Space Telescope a defecthe up of an and the section is a section of the se Most of Smolin's research. How could we know of envthing beyond our universe? In fact, doein't the word universe include everything there is, by definition?

The tribuly concepts of the origination of the second seco

word universe, it is to this dy namic picture that we normally rater.

But have did the original explaces have place? In while containe did In import? Could be approximate the second second beams of provery that in the second beams of provery that have be section discussed in sublasection discussed in sublaback there have bactered New, however, in has become neepschaft to be abwing the second second second beams of the second second beam of the second second beam of the second s

Les Broin's answer may give the word universe a whate nee demand in Acoustic versarion with him switch becomes a cascide of ideas, thought-providing reflecttors, and gluppes of infinity. If a tenth of what he contemplates terms out to be true, humanity's view of the common may during exerption for the common may during exerpformative and the common may during exerption for the common may during the formation of the formation of the formation of the terms of terms of terms of the terms of terms of the terms of term

Born in New York Dity in



The universe may be a mother, hatching baby universes that live and die, and, like the organic species of the earth, evolve.

1965, Smolin received his PR-D from Harsed durg a timo of formert in physice. Neutrino telescopes were deletion and a factor of the expected minipart of during an Astronomers were finding their most of the motion and the most of the motion and the transfer of the harder dark matter. Physicasts searched terventy for a Theory of Everything that would explain all the twos of matter. Astronomous accounts

"I was worned," anys Smoin "about the losse connection between the venues theones and experiments in elementary patieta theory. The theorem has seen most compelling on mathematical grounds, unfortunieshy do not readily yold unimburous predictions about netras. If its, heardon, genant y difficult to test these theoone assessments'.

Casting assume for a way to the first controller, to the first controller, to the decision array to the second backgrain a times to be added and the second second

"I was reading Lovelock,"

says Smolin, "and the clear supposted itself that if one call apply idear from boldgy or receiving to understanding the whole system of the centric climate, maybe some thing like it could apply to coemology as well."

That he lefter/D2c0 the compet of balay unversise, an outpower of an index per hard proposed of an index per hard processed that two may apprecise of space-or even two separate commosus- occul, bo predia at Provide an of a company and a per event by the dama per and process of the weather (Normfoles and a weather (Normfoles and a weather (Normfoles and a second by the dama per about observed to the dama per weather of the period period white an an explanation value about observed to the dama period about observed to the second second period about observed to the second about observed to the dama period about observed ab

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"I actually clonit like that tanminology," compleme Smo-

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For Sker Yreb<sup>+</sup> fan itpraghout lie krown universe, lie ditare han zower leeked loogitor... because Skar Yreb: The Nort Generatives is now worksholo on special deather equately Collector's Edition videocassette, uncut and universite equation (and the statistic product) and the Librory Yayr interfactore video contains the seciliting generater, Rossaniar at Arapaist', reservition

Your introductory object contains the entiting premiere, Nanotanie as Jarpeisti, etby legenchay serves creates Genes Robbecherry to this first critical masses, Captain Jeny-Lae Preard and his newly containation of first officer, Genmander William Robot, load the crew is a rance against time to ashe this reportery of the Report Scolar and escan certain scores in the shall so insperteent 2°C.

Jain all the estimated have never to be a surplution of the two-blooded Kilogion security officers, Dats, the Ardeod with escopilitural addition (A. Georgie La Ferge, a technical wanted dispite his Minimus, beautiful Connector Tris, the Descende with estimates addition, and others

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Much is: Columbia Boase Video, FO Sea 1113, Dear, MFZ, Terry Hands, IN (1912) In. "but it's fascinating that people would use a belogical mittaphar. Any way the idea of a universe sprining off decorridaris turned out to be fruthal." Indeed, a few years ado, a number

Howe a low yours up, a lambde and the second secon

How could a loarneweary could not be accorded a loarneweary could not be accorded a loarneweary could not find the second of the second accorded and the second of the second second accorded accorded and the second of the second accorded acco

Accessing is the freezy diponent inteantity for backets with the recent of the theory for the start of the start where hole "Physical call the start of the start of the start of the start where holes and the start of the start phete Lands in number of physicals, includes a land the start of the start the start of the start of the start term works between the start of the term works between the start of the term works between the start of the start of

Does this mean that we are fiving inside a black hole? "It this idea is right yes. Smolin clates. The idea that I and an over others have proposed is that our unverse could have grown from the inside of a back hole belonging to another unverse. Dur universe, in turn could itsel be spinning of thirty roggs, some of them developing into full acate, mabare universes, and so on.

But could these 'reproducing' unverses take on yet soother characteratic of organic We-could hey exclud? Smole flought he caw a way

The resource wert like the II take openating in the paper, commo were transitied to the chief, discutre unverse empth teamting the industrie unverse in the second start of the second committing like grows. If the therease inter damped startly from generation to generation, but is general mutate them generation to generation, the dationanders universities injuly slowly change ther characteristics, in other worth they words where

> The best place to hatch a baby universe may be the dense, inescapable center of a black hole. 9

Invite: then found conduction growth in their autor Freideric Foot oals to Gala Mantage---analosis of the table from the phase of data to a phase data that the phase of data to a phase data that the phase of data to a phase dimensionement, and the model of a phase is for example the mose of the phase is a Gala that the data that the phase is a Gala that the data that the data the phase the second of the Gala phase is a Gala that the data that the data the gala that the data that the data the second of the data that between interes. The phase for data way large would be very very of thereit

Streph was percularly known of the cause many of the Ook Numbers, lumed out to be necessary reliant bit we extincted in stants put for bologicall fire as well. One such special value was noted by controversal listish asteptysteast and science listish asteptysteast and science listish netransition was born---tray in draw at learners to the above of cables. The deTheir double In meening The organic modecodes essential to benotifiel the AL cobon were organized to provide the entry and notatic, by karging logicitient there has used to be a straight of the collecting alternative quantities of the the collecting alternative quantities of each the collecting alternative quantities of each the collecting out alternative times or all legithy higher Hoyse enuousd. The rate of each work is culatern works the so store high work is between the so store high work is be worked addits in the works. "Life as we show the collection to be

The poet, says Bendin, is that he costs humbers determining physical laws: may bartolog torrewist law the bar and one of the physical lawased the says and strateging the says and the says and strateging they makes with technical experime they makes with technical experime they make says the technic they make says the says and says and the say

"Jut me start from the increases refinring the biology insigation further. The interrupt exists, also cardian patients interrupt and the biological patients biol of black holes which lead to new inventions, each back of the patient investor biol black holes, which is main patient interrupt black holes, and so on which we bias the other answer patient mere black holes, and so on who to and their of university. You have a walke objection of them.

If this Diskie wage is right and black noise can be likened to "Universe tage, then a coerror that forms minybig other (which can become black holes) with we man offspring than a coerror where physical laws are less formally to elitar termation. The mint of and making will be passed on and grow more otherwill with resh conservation.

"And that's where we obtain," Brook is continuos." Bocaso if you make stats, you can alte make carbon and exysten and table of other good things, two panets. And a unverse with panets recard also containing abandint amounts of aution and oxygen is a unverte hoopation to the may owe verses need status and block holes if they is point to revenue.

Smellin admits with good natured humor that this is actravegent speculation, yet he hopes to correctly push this provofful ratios from the realm of more conacture to a bona-free friency. "If the idea's ever to be real science, then it tess to be tested." He suggests one way that might happen. If you change some of the physical payameters, say Grah Numbers about taren the effect

hone, however, and a crowing under may be able to build a model of our

characted John Preside, suffer of such

the Except a series of reproduted lend-

Similarly, pays Smoth, sneal nakar, and blen then Milley West come component in stats. A dalary is a system for covernwhere 'One sees a large amount of cas and climit and star formation that is a continual propage" Dicher the closing or stellar words. "Within a hun-



YOU'LL BE OLDER AND WISER when you see this batch of Tennessee Whiskey again.

It's headed for aging houses in lack Daniel's Hollow, where these men will roll the barrels of young whiskey (fresh from our charcoal mellowing process) into place. There, the barrels' charred oak wood, and the change of the seasons, will do all the work. Years will pass before you see this whiskey again. But when you do, it'll be an old and familiar friend

SMOOTH SIPPIN TENNESSEE WHI

Description (Budge a \$1.515, dealed in places 13.51 much a fact that and fact that

### OTHERS HAVE TRADITION WE HAVE THE FUTURE.

retring dDD is the epitime of quality and precision styling. Fourtrain peri, ballpoint, roherball tra-peri and period. Matte-black or silvertone tristh. Also with gold accents and fountain peri with 18-brand gold hild.





# What Makes Us Better, Makes You Stronger.

Well-masched Arms, A Defined Chest. Chisled Abs, Porrectful Legs. A Stronger Back. Add samgh to every mane much group in your body with the taw advancement in samgh manner. A code Dis.



and million years the speak arrse will conset of complexity allivershift matanal and allivate stars. But he pattern will term to outmarkly talent? The attents, terms to such as the start of the speak matanal such as the speak of the speak matanal such as the speak of the speak term of the speak of the matanal seak matanal seak of the speak of the matanal seak matanal seak of the speak of the matanal seak matanal seak of the speak of the speak of the speak of the speak of the matanal seak matanal seak of the speak of the

A basis reasoners with stim in the sometim emption of sectomerization is werty theory teritical similar that the basis could be minimized to the base many of the theorem product to the many of the theorem product to the many of the theorem product the theory of the theorem product the theorem is the theorem of a second tradem mythe with unless sector and the theorem is the second to any of the of theorem and they are not then the theorem.

In other words, given the preventing contrapton and dissemeon energy proleage southy, binderin now mind bording, revaluations, concert severe night uneer preven context, Darwars with a prevention of the south of the over megacoence dimensions are well how, so the trainers well of the base, so the trainers well of the chain of emotions of proc universe, a chain of emotions of proc universe. In chain of emotions of proc universe, a chain of emotions of proc universe.

The next accels will see many characents test constraining theories of the pand tack optical telescopes will be openorging in Heart. The Hubble search bireacting will have the principlian freed measuring the mechanism of the telescope inductor they remotences in telescope of ublacky task extremolescope in telescope inductor they have been unable to perception telescope description from out a writing is book about the their and law terring is book about the there are full different to the theory and optical terms of the theory terms of the terms before description the there are full different to the theory of the terms of the theory of the theory of the theory of the terms of the theory of the theory of the theory of the terms of the terms of the theory of the theory of the terms of the terms of the terms of the theory of the terms of terms of the terms of terms of the terms of ter

Entration would probably have all skiele on his based and released his dictum that "God does not pay dice with fire universe." But Strephen Hawking's ferned kelot captures the spiril of Smo lins theory. "God not only plays dros, he also acmetmes we'n throws this doe when they cannot be seen."

Into another universe, perhaps? Use the rest of us, the utimate cosmic Creator may rely on the even-fuldul, eex-converse cruit of molitational DO



Articla By Bannis Overby



A queste of desinguished acto-physicists published a lengthy now, over rance Edwin husble in an adversarial and somwards may and an in decorrect that the approach and adversarial approximation of the source of that the approximation of the source of that the approximation of the source of that the adversarial approximation of t they say a overwhairing evi-ponding. The Big Bang has beciones that the universe began come as central and indispensome 10 to 20 bellion years sable to cosmology as evoluago in a grgantic explosion. tion has to biology-and as That might seem unremarkakneting a target for those who ble arrest to Orres markets, Althink they have a serious bone to outs with modern science has been part of cultural mytho Docostly becaused many



Bung Theory," read one of the Basg Theory," read one of the articles on the loost page of the New York Theors in Janu-ary of 1991 not devoled to the carflect in the Persean Guill, "By Basg Blown to Proces," recent the Denver Past, whereas the Denver Past, and the Denver Past. Adding to the sense of metor ical SCUDs rarring down on cormologists' heads was a new book titled The Big Bang Never Happened by Eric Lern-er. All through the year, you could read wry articles by news paper columnists who were taccily and relevedly throwing away their copies of Stephen Hawking's mogazitike A Bost History of Tana

But this spring, the Big Barg was assended agen on the front pages of every net ing these books back out of Cosmic Background Explorer satelite (COBE) announced that likey had descrived tray angle in an otherweak smooth and takint glow of radiation which fills the sity and any pen-samed to be the abbreach of the freebal in which the uni-verse was born. These tailtale lumps, scientists said, were the very sciels of the start and calibries that sciencie the modemnicht sky and showed that the universe as we know it might well have been peneral-ed by the Big Bang. George Smoot, the head COBE scienface of God." As COBE made clear, the

media death of the Big Barg was greatly exagonated. For real cosmologets, Trese days, the major question is not whether or the Big Bang over occurred, but rither, how: Physicals on as far as ever from knowno what forces ocverned the unfraction of a second. What

is matter or energy linger in the cosmos today? And what knots have taligled specetime

as all that onergy and matter rippied outward and cooled? In some sense, these questions emerge term a crisis of success. Without the frame-work of the Big Beng, cosmol-ogists would have no way to bly, wrong talk about the universe at all with it, the cosmologists can fusied about. Spurred by breek-

throughs in particle physics, cosmologists have pushed their therefees for their end forther back in time, to within a forms of melter and energy whisker of eternity itself, and title excuse to be taking have made increasingly pro- about the hist microseconds of

nio what the superse would evolve of the same time armed with a new concration of telescopes, detectors, and analytical techniques, ostmomers have been able to test these predictions and find shom slightly, but unmistake

Costtopoy, the study of the below and haute of the use verse, is an old quest, but it is a young science. So young, in berno that they have a scien-











cientists' theories of the universe reach within a whisker

of eternity, but are they correct?

family alcase "Antroportry is not antrojcov." Jm Prebles the Princeton coarrol ocooress. But cosmology is not streight physics or champay either. The our patriarchy, our mythology and a challenge to it produces more threat ening (or promising) reverberations than, say, an argument about the evo-

was a Big Bang-that the universe had a certilable beginning-was born cut seem to be rushing cutward as if they were shards from a crant premordial explosion Dark in (999 bit phile in and that the light from all but the very closest galaxies was shifted toward lower. rodder, frequencies, the way the srund of a receding automobile sounds lower in prich. The more distant a galaxy the greater is so-called and which and thus, the faster it seemed to be maying away According to Hubble the molece of the codmons, as defined by their receipting, which are the ion years ago they had all been togeth-

Hubble's law found support in Elisteen's theory of relativity, which held rwhit the calaxies along like surfers on according to Hubble emerged in the decades that followed, as astronomers light-years out into space and found that the backs relationship between de-

ultrate beginning of beginnings as radiation, a faint uniform moneyee granded to 1045 Means opposite only the years have found that it has the proa facing prenertial feebalt-in which that the background radiation in some

Urang the metrowave backgenaged to clocupe the temperature and density of just how much heisim, deutenum, and other light elements of a likely to have prowith the abundance of these elements isr space. The same calculations also predict no more than four families of elewas apoptacularly wirflod throp years bin of the Camegie Inditution in Wath-GM CMM

aco at CERN in Geneva, Sertzerland,

Finally, and intriguingly, there are these different areas to antimate the and pansion the ages of the closes stars. and the ages of radioactive elementsanswer, between 10 and 20 billion years. As Alan Sandage of Campop Ob has spent his life measuring the colagree-one could have been trillons of ware the other Brussed's its offer a really did have a beginning

The statement that the unsurer her fery however, it is only the beginning a patentary to more mantheres. What caused the Big Bang? Will the universe

Why does the universe look like it does with hune clouds and chains of stars strung like Christmastree lights arrose the blackness?

expand forevor, or is there enough mans for pravity to drag the callacter look the way if does, wirrewi but no cashe boreconcern with huma rinerth and chans of stars strung like Christ man-tree lights accord the blacknass?

more ambious questions, astronomy un devent a sort of Darth Vaciaron can rec okideo in the endy 1920s is which the most reportant thing about the universe

The there was more to the sky than mosts the even had been apparent since the 1920s what Fits Zwacky a Cal tech sationamer, concluded that clusters of galaxies must contain large smounts of invisible mass in order to secvide the gravitational nice that knew called it "mosang maps." Forty years lat er, pansaliving observations by Vera Ru

moton. DC. and other astronomers were whiring around too fast to be kent in their orbits by the provinc of the dery curis of light photographed by bergs, it seemed, were crivilitie visible centers of much vaster and more man sive clouds of invisible something. The ed to react to this development as if it. when their worst rachitrane. "I hope the Jease Greenstein, patriarch of the Caltect astronomers long after uniortunate by the data showed that I will

The mosting mass, colled dark matter was embraced more embusidedal ing into poemplony and had less entothe vouncer theorists for its mathematingli antipation. Morreson, il clark malthen if many be dark matter that former the crawfatorial molds for naltime of the universe might lie in the day

twose connectivants twose mount the past archaeologeits burrowing through keywere a weetoo of Po Big Bagg known inchrungly as the existences of a triberth of a successful time. The shows the ranki is scenarial with distan-

The cuintum cosmic history began with a resenture twitch in some kind of ad that is an expanded slow of pottdense, and enfolded more deliveration them a men with meschidy ins the Unishares heramp most vancoated Al some point outly on, a strange energy intern as the Take vectumit properied the comme reperision this separation watering the separation of the separation mitigate by its inventor or discoverse, Alan Goth would have orasid all the imgolastics and chaos of the original Big Bang But quantum fluctuations in the take vectum produced sight unduktions in the distribution of matter ad everys where infance moded

These industrians are crucial to commisgigits and the unwent because, according to the model, they formed the gravitarional scattficting for the galaxies, accurd them for the next bidina system reads of with the cark stuff and would cool of, weiking to the central of the cluster and calcologing the galaxies.

For the last decade, contrologists have spertmand of the energy having to figure out the stority of the dask met to. Early speculation certifiered on matimos, spooly sublations: particides involution have been cereated by the backetur in the Big Beng. But multinos alone involution computer simulation back. They were so light that they these back to assess methodial observe.

The counter thermose gradies Portunately the came thereare that produced such wonders as inflation aloper other particles shrinks the analogene other particles shrinks to meaning. Us shower and the thirds behaviour and to making galaxies. These prospective and across. Collectively, they were lower as one prediction, gravitinos, and across. Collectively they were lower to destinate to destinguint them from the speak results.

With meet nonweak of the second control contrology became a first-control control of the could be there in the particle physical in the text at which built magning unwarise out of hese particles, and the obtained of the set built magning the Al first, cold dars matter seemed to be from the full most into the playing based of fields in the seemed to the right staff. These this the playing based of fields in the seemed to be indeed a sinchray to clamo mild in the gainers. Moreover, these galaxies indeed a sinchray to clamo mild or all groups and the galaxies in the set

Cold dail mater, combined with the physics of infectin, guiddy became a works. but there were a lot of things in drift explain for example, precursion of the dramade structures of the present dray universe thoughts to been watert as lift inst apots in the increase back ground, wrisch dates from when the unverse was but a hundred thousand years old Netmassurements taken over tho years had failed to find any devetor from bland uniformity

Perhaps mail agrifuer, was cold dark matter i ambing to from very large ethuctures. The site is specialed with large classifies is containing thousands of galaxies. And each classifies integer structures, was and and sheets eritiding voids estimated to be humdeds of mitigane value and and sheets eritiding voids estimated to be humdeds of mitigane value account for becomes based on the existence of becomes about the proof himmer, legit bengrap here in.

Cold-dark militar all contactos downplayed the significance of these discovenes. Were they real or illusions? Suppose, said Nok Kaster, an extrovened Bet with a table for loud drink and ourk-

> The seven
>  Samural found a great chunk of universe silding sideways,
>  moving at 500 miles a second toward the south.

with harroug, that the spociality visit were not really enclosed by bar at disk. If if here density closed or and antimatics must close the were the sports of comprisity in gift to with items in the supposed in trutice parentise by direct ally realling the sports of the sport and spocial interview was servicing of a mannet', supported or an emission of a space in the sport of the sports of the the sports of the spo

Then came the Sever Semunia and the ground begin slowly to skick out from cald dark matter. The Sever Sam usa were an international group of antroy are to University of California, Somo Oraz, who surveyed the distances and result who can of several handbad siliptical galaxies on 1965, and what they land antionnel newshoot. A churs-

al universe roughly 300 million lightyears across and containing roughly 100,000 galaxies was not only expanding, but also sliding sideways. This grad asparse of the cosmol, if turned out, was being pulled at the rete of 500 millis per second towards a particularly large concentration of galaxies and fuelers in the direction we call south

The Barnus work created paratemnam when it was announced et a amelia cosmological meeting in Heavie in 1966. Cashy the violas and chans of outperclusters were not Busions after all not grassipast bot mail. If meant that the universe was finally inner that the universe was finally inner that the universe was analytic and the universe was applied for the American Cashy and the American Cashy and american Cashy and american Cashy and american Cashy and and the Cashy American and the American Cashy and and the American and the American

Therepode agreem that the Great Astractar was on the harry edge of when any protocol service or collect dash descriptions and the service of the service and service to observational anonetiction of the service preverse in the service of the service preverse in the service of the service service of the service of t

The burning guestion was there these typical of other guilands in the units when or exceptions? The there, length ed cold-desiv-matter handman life Kase or Marc Davis, could always be unactive to any or other always be unactive to any or other always be presented and the second any or other they keep saying not just pictures to point at

In seven of botter statistics, many close seveness turned to artist of galaxies compleid by IRAS, the infrared Aeronomy isomitin. Aller statistics and an analysis of the light-years, a group led by Oxford anmostnerer WIII Saunders conclusion that superclusters and vecks were inthed common primomenia, too comdeed common primomenia, too comthe journal Nature in January 1981, they concluded that they are inclusion the power in the them is more inclutation and the them is more inclutation and the them is more inclutation of galaxies thereiners.

Since the group included several high prests of cold dark metter the report had enormous impact-in fact. more than was introdied. There is a clifterrence between ookt stark matter the material that apparently foots around national and only dark matter in the colgalades and colo daw nater in the gations that included not only the invisible clouds, but also inflation and little quartum working in spacetime from tool but that distinction asserted loss of short step from doubting cold dark mattor to doubting the Big Barry dual

ortical element of the widely accepted evolution of the universe is being discarded by some of its staurchast adgy mo turnoil." Synchcated to other

These reports appalled the cosmolcosts As I tappened, while these haad wini erusting in the Person Guth, the cosmologists were gathering in Aspen for a week long meeting. I found it om of the crosses we have to bear." grouned Peeblas, who announced Checaco astrochysical "doesn't mean

Asste from the Big Rang, however, was oversold CDM [cold dats material rever deserved to be called a standard

Descrip the theoretical uncertainty sowwar one thing that cosmology is Inv yours is more evidence. More emiliarcasemards to theory are board to norma from the Hubble Space Tele-NASA's new Germa Bay observorory. instruments hered built "The Fighteen were the decade of ab unit theorem." Dre of the mast people of phenoti-

mylhowide word amongs/y mention, was conce very cicele to satisfying all the con-

nershine moosurements of the control second authorities is at officer a posterio of the early unsummer it should accord Twenty years of searching, however, had detected no incerol clumpmess at the backnessed radiance. As CORE launched in 1959, began spinning arross the sky advocates of rifecon more computed, among Attar al i quartum fuctuations (made possible by inflation) were the original seeds of the

In Aan, CORE scientists announced is street-ends emulsion faint hints of

60n the vastly overexposed the helps universe, one could discern the familiar, grown-up face of the universe today ?

oray tracing the features of a furnise verse Cosmologists worktawte breathed an encemena sigh of relief

Other theories also produce Fuctuations. have been happer news if COPE had /of soon fuctuations. Momoune Citizally antervine could only measure the wolthat presumably collapsed into galax-

Finally, the temperature fluctuations menaued by COBE were about twop ory predicts At a recent workshop in Princeton says Princeton astronomer standard model is almost there and With a way contrologists have to po

Turner north out that Anatolie was

that everything revolved in circles around the earth. Ptolomy then "Ixed incre-to the planetary orbits, and cosmolocy went down the wrong path for and the plenets went around the sun The bin question in cosmology is!" era?' Cosmologists he predicts, will be

Cosmologists, goes the old seving new other, where had new if the bit for hit for maph wonder whether the worth maxitering the next generation of theory sates 4, too, may turn out not to be true What's the point in all the Brashthedrais of the mind? The great obset unternet competence Alleg Sarctage is

The fact that commingate are often wrong, however, close not mean that and two they say is around They are not wrong, for example, about the Bag Bang in any searly foreseeable way,

pook the truth under the provisional some buth to be found that there are knowable laws that govern the universe. son, but it is that faith that makes solence possible Like good bridge play cards as if there were a way to write

greater mystery What we treat ask in physics? Why should there be such a Imp? What are they made of, these fundemontal but revenuely vulnerable and fation theory the venetions measured by CODE are relice from quarkum fuejorth of a trikorth of a second. Prescasts have lorn their held out for most of guertum theory and quantum fuctuagalaxes and thus us That something as fordly as a galaxy reght make us won der whether we are all in fact such stuff as dreams are made of DO

On the lifth floor of Boston's Computer Musematics a massive hand-cranked computer materials activate out of their law and 10,000

another Treating onthe The compare is designed to ally follow-bar and Tais yield to be a grant of acade parameters of the sideox, and the Disprictive entropy as grant of the bar a parameters of the sideox and the Disprictive entropy as the compare of the parameters of the Disprictive entropy and the entropy and the Disprictive entropy a

"If every time one of your neurons broke down I replaced it, in a century your brain might be all transistors. You'd still have as much soul as you ever did," says the binking man who's putting the soul in new machines.

PHOTOGRAPHS BY PAULA LERNER



agains of supercomputerdom, they agreed, were the high-powered, liquid cooled, one-job the time machines built by Crey Research. In 1980, Creye ecopuries for nme-terities of the supercomputer market.

No once: Convector Naccelerate Issee was named or recurs y speed tests and the opports have comply dependent tests or A level. The mession y wears y accounted for the a sublition base comply dependent tests of a level. The mession y wears a product of the test of the analysis of the sublition of the sublition of the sublition of the dependence of th

W Daniel Hills, 36, has always been a trikever As a chrid, he built a heme robot using pant cars, light builts and a robssorie mo



### "Like electricity, your demand for computation fluctuates wildly. A network will be your desktop computer into a shared Connection Machine somewhere, say, down at City Hall."

to Reading Robert Herrice's Alves Spaceward With Real Impand Im Its and Tal 24 KM 1 where its East with model development of the second second second second mechanisms for the central laught of electrones. A Notice of the Social Second entertaints in the central laught of electrones is Notice of the Social Second sector is the Social Second second and the Social Second Second Second an egit central-central of The electronic all registration of the Social Second and the Social Second Seco

Dang Staat reterward the compage motion at a correr often ownoolng the Crastes Paver and Daucon Hit-Heis is outgoing and philosophical with the two-says stightly insufaces. In the two-says stightly insufaces and the philosophical corres works at the philosophical corres work at the philosophical corres at was control on an owner state. A woodhaned backboord tilling one wal was control on an owner state and backboord with motions and experiors. Nons, 200m and States Correspondences have college control of the sectors.

#### Owns: Why did you name your compaov Thinking Machines?

Hills We wanted a cheam we waren t going to outgrow Building a threinig mechine hes sivesys been a personal dware of mine, and my conception of the Connection Machine was part of the Connection Machine was part of that I like to ave i want to make a com-

#### puter that will be proud of me

Onn: So tell us, how does panallel procecono woh?

Hills interest of typing to do non typing that are particle consolvations of the typing to do non typing that are influence to the second transition. If a second the second transition is a sequential, comparison to book at 1 portune and a toron with approximation of the second transition of the

Onny What soit of problems tax conventional supercomputers?

Hele in Noblemi Stati elique themis procosa ist of information. The more werhumanic learni. The lastice and einstein gives a sequence of the second second gives a sequence of the second second gives and the second second second second gives in the second second second second gives in more through to load through the interest gives and of the Catch-32 The blogger the problem, the more procingers in more to load at the first second second much them to load at all packars have a blogs and bg or to second second

Orex Why heven't computers always been paralle?

Hills Selecting components, such as vacuum lubes, were tag and repersive the used as few vacuum tables is posisible and used here over and over The every Title citic in a pectre was rideous loss when vacuum tables to every Title citic in a pectre was rideous solutions when vacuum tables to every Title citic in a pectre was rideous solutions when terminons replayed solutions with the solution with the some base biuspent—they just legitimisticized.

Ormal Aren't sequential computers aw-

Hits, They appear at these people an experiment of numbers of sparrag out where the triangers to be in dominion years. But they instrument and the theory and the they instrument and the theory and the people of the experiment of the theory and appeared in the recognition the maximum out labeled approximations are people. The the they are could write a people in the the space could write a second. The assessment is interface of an experiment be an appear of the the space of the second and the second of the space of the second of the assessment is interface of an experiment be an appear of the second of the second of the assessment as a space of the second of the assessment of the second of the assessment methods only a few handwells.

Ones Then why are brains so much last or than computers?

Here, When I started or MTs antifold Inseligence Lab. I was derived to me that we were detegring a the wrong was Tayre to reduce the number of "vectum tuber" was no longer the right thing to do. If you start from scatter with the same type of compoments and rearringe them to compute more quickly, you come up with one communities and



#### PRODUCT

The Dansection Machina, a supercomputer with 61,00 individual processors working in natural

#### COMPARED TO PC::

Each Connection Machine is organi to 64,000 conventional computer wolinitations

#### PRICE TAG

\$1 million to \$30 million and up

#### WHO EUYS THEM:

Lockheid, unversies

### OREAT THING ABOUT HIS

"Reyard all the approachance is the uninstead domand for more computer power. Buery time you instreame the power, you just what everybody's appears."

#### OUOTE

"People are offended by the nation this thily are machines because they're familiar only with studid machines."

LIFESPAN HOPED

# "A Case Worthy of Yo<mark>ur Falents, Holmes</mark>



toteract with discens of unique characters, each with their own personalities and alibis

Use the detailed overhead map of 1888 London to identify your cent sleating location

Refer to Dr. Watson's journal for a detailed record of your investigation

Use your laboratory at 221B Baker Street to analyze clues

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# ANTIMATTER

#### STAR SEARCH

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With All Tarter of this ANAA Annote Networkshift for Genish yawag on the wale of deviced *er all* project operative takenose and sweate the takenose in borne and applied from spectra in address to this blay Bakwag applied and the spectra is address to this blay Bakwag applied and the spectra is address to the spectra term will be market and for at least flay market on 1200 septimize operations. I 200 different financema banks

"We can't listen to every stay," explains Salles Bellaness, depuig cheater of the Mt. Weson hissitute. "Thore's not encough time or morely for encough time or morely for intal Bot was figure that it intaligent Me developed intermayter it developed interwhere, too: "

To be selected for the NARA he lists insummariant meet several criteria. First, they must be close encode to Earth to: NARA's equipment to actually pick up the signale A closence of the light-years on lists an uckast, Chessen slars must aliab be similar in mass to the sum. Since mass can be closented by color. The



from intelligent ETs

scientists seek out other yolkwistars.

Problem to the advertistan must find stars similar in ogo to the sun. To determine stellar age, the ML. Witcon scentilists mozorus the percentage of starsight entitled them calculate above in the scalar's attooplers. This so-colled 'taskumensoing' millical shu magnabe adverg of the star witch. In the scalar starso Qualitied conditions must be toughly 3 to 10 billion years an observed onlineation wouldn't have had three to develop in less than 3 billion develop in less than 3 billion years, while starts grabble three 10 billion years old garets and swellow their minor, hatwello planets

so tay, sesures and reproceder have identified 200 stars that most the standards. They will need to mucky 10,000 stars alrogather to finalize their lot of the thousand most eligible something they hope to have ready in Time to Ree verses.

When the left is colorizated in the loc activities with Just's Jahrwo Them it of the Mit Just's Jahrwo Them it of the Mit Just's Harry and Jahran and Starty Lathan and David Societation Lathers and Starty Lathan and David Societation and Jahren and Starty Societa and Starty Societation and Starty Societation and Starty Societation of plantal systems. The societation of the vedderood of plantal systems. The societation of the vedderood of plantal systems. The societation of the vedderood of the vedderood societation of the societation of the vedderood of the vedderood societation of the societation of the vedderood of the vedderood societation of the societation of the vedderood societation of the vedderood societation of the societation of the vedderood societation of the vedderood societation of the societation societation of the vedderood societation of the vedderood societation societation of the vedderood soc

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# ANTIMATTER

#### WHEN ET PHONES HOME

"Phense leave a detailed message," his vacco says. "(ii) teden to it carrolwy and metoots appropriately." Donald caddamith, who recorded this message on his answering machine, belavel we should adopt a climite stategy in the revent that ET true to "phone." Clockmath, a water and

Cloidsmith, a writer and consultant at Intensieller Media in Berkelwy, California, was one of the first to suggest

#### We may receive a simple pure tone or an Encyclopedia Galactica. The possibilities are libilities are liberally endless.

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"The intraects to those questions will depend on the nective of the signal we nective, a simple pure time or an Encyclopedia Calactica. The possibilities are Harally enclose." – Store, Nodes







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#### MESSAGE IN A BOTTLE

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Came quekly.—Arthur C Clarke, science-fiction when and futureit. Sin Lanke

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the story and lister to it with you.....Charlos D. Walker, former shulle astronaut, president of the National Boaca Bociety.

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"I don't think it would be a good des to send messages into space. I think it would be promotions."—Philip Momeon, physicist, Mill and SETI senser. Combindos, MA

"I would live our live cantials with extratomostrial intellicence to contain a statement Washington, DC, and contributor to SETI

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"Be patient with us. We are a young species and have much to learn.". —Freeman Dyson

San Francisco, CA

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"We are one species of two sexes and many different races." —Charles D. Walker

> approach human relations. Consequently I would trans

Ceneral Assembly Witnis we haven't yet acteured all that

the Declaration calls for, the rights enumerated define what we have learned from

our Instary and how we have to behave, especially if we are not alone "---Alaen

Cloodman, associate doan of Georgetown University's School of Foreign Service,



"We're here." —Jill Tarter



"Let the broad cast contain everything our civilization might have to say."—Donald Coldsmith



"Our transmission would include images of human anatomy and DNA." —Buzz Aldrin and John Barnes

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Actual C. Chefer, right, hopes to been lister relatigent chillcalams in the stres







For van det Eliz, the conclusions are nescepable. "COTI players reflect their cen cultures no matter what they thick they're doing. But what you can do with COTI is create a substitute two mins spoces, a sepacient third can do all the things humans could do if humans what been such substitute."

Several members of the succence rated the obvious objection that no human could really imagine what it is like to be an alien, complianing that COT(is aliens were that), all too human Elem

some members of the COTI team feel that the process is a bit ally, that more time could have been spent on asance, less on imagnary culture

Tably could be supported and the support of the sup

CONTACT CEO Greg Barr roses a bagnt futura for the remprofit organization, hepiring if will serve as a cleaningheuse for distribut-

Ing and desimmining ideas about inbritishing communication. "Because the material bridges schnelogy and social sciences, he says, "Its difficult to left the whole range of materials, especially the cuting-wolgs tapes in school or publia flosures."

In fact, the minging of disciplines and professorie is what attracted many of the early DONTACT participants in the test place

Bit abricat his has CUNVACT in 1965 'I was excited about sears how the venues deceptines worked togethet," he says. 'What particularly interested me was seeing how different distoptines would reconsorbit and extend these far-reaching ideas about extratensitinal communication "

Bant's amb bioss inside: the functions of a flatehener, guide for strapping CRH-VRGT and CCIII events in the classirison as well as the development of world-Ruiding unbased for generating CCIII worlds. We want to generating actuality, the resp. "Thereis to restorn why if carl to extended even down to the driventary level."

No reason incleed. Part of the great joy of the CONTACT conference is na dence of multiple disciplines, the reinforcement and servegasition that leedbook across cultural academic, and soworld in new ways."

How weld can role playing finally be? In a people writen in the mind 1980s, deing the early days of CONTXCT, colounder funato spelled out their hopes for the continence, and in dong to, rasponded to some of its ontoo

<sup>4</sup> Play is not finetous, but it somes a new and ontoal adaptive function in our species. Without our play impulse, we might new? have achieved our level of biological success, technological development, soentific incericidae and act.

So DONTACT, finally, is play, and admittedly ac, but play of a very high order, with deliberate purpose if not

goals A thought





call links provides "DDI should some as in restruction behavior the humanities and the hard science," says us date Dat "Date within submispaceproposal anthropology, which is containpology, which is a scolar justice of the build be tage. It gives an science CD T beitiges the gap. It gives an science thing to am for Most of all it employs our imaginations."

Watid and culture building are sophracetoid play, larael Zuckerman posts out. "These exercises are intogrative," the says. "They recare propts to speak different technical languages or rentegrate their lenowledge of the your creations' growth from unoreasure to manifalliar communection Links at the stars. Conceive and encode a moslarge. Send if our into the universe Mallie contract DO

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If fans had their way says Sci-Fi promotions coordinator Paul van de



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Owner What do you charge for one? Hills, (desitpen) Several hundred milion datare So far the biggest once were sold are \$30 million machines Ownel, For years, you and your revia have made leadingung datare dr, "Ownel computer is feeteel." Does it really mettic went feater?

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# GAMES

### WHAT'S IN A NUMBER? Fourteen divulges its secrets, just in time for our anniversary

By Scot Morns

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Morea Zarger of Admoss Controls larger suggest of rearverging the styload istream in the COMM logo to form NO 13. This year, si Crear competition in Kourtiseth system of the Comtineeth system participation (No to suggest "I'm 14 real gains on 15". N and O are the bastaseth and filteenth where of the subjective

The product of M- and 15 equals the product of the final sour pame numbers (14, × 15 – 2 × 3 × 5 × 7). If we even at the sequence by matplying by the next prime (11), we get 2310 or **control** said? Just reomange the lobars in our logo to produce 2310.

What's the significance of these 14s? Answers appear at the bottom of the page.

- T THOM GOT NEW I
- Denot a sell of sell
- A Propert and football
- 5 Dale and base

But enough about us Many of our most interesting puzzlos come from readent.



and the two labilities cross labove airs in exception. The "call" (A) conversion from Lived King of Codoutaines, Engl Jana 14 aleges also and provide by "Horse Anound" in the May assue, which required by these Anound in the May assue, which required by the conversion of the case, the challenge to to service enother coll paties in the interview direction.

Angus Lavery of London offects the three zgzzig shopes above (B). Cut them out carefully, and using all three pieces form a calofal jetter E. None of the pieces should overlap.

Also this month. Kulz Press publishes AudSheoanigans. Greet Tangle to Do that Mom and Dad Wel Aset Benely: Approve CV, a celesion of sounds. Index, and practical jokes. Hare we have of the best.

THE EGG. Tell a parent of

older abbing that you have a mage trusk that requires their expert help. Open a door haldway and stand your wohn bahad it. Get him or her to gobe a tharto and forefrigar though the crack part spool them the frame more, hand there in the team more, doet hereit.

\*BODA BOMB Somewhere where there are lots of pacefe around. Sale a can of social and shown in weathyl. Hold is by your and and inturp it soundly three or four times with your friger Sary. It sounds rese to may, and ammediately put the top Naturally, wereynes will sources and spirit.

The surpreze is that what everyone expects down t happen. The secret less in thumping the can. "Better do a good yob of it," warns John Cassledy, prosident of Kutz Paece, "secol all the bubbles that are anonce to come gepaining out and hanging on to the eases of the can bis brids to the caring of a cave. The inger transperies and back into the tecks and back into the tecks.

KudShevangana com46 complete with a make-8 youriail whoopie cushion for \$13.95

HOURGEARE UNDER In these of you pondering late meetings housing have the service of the Available version of the puzzle called the articulars, late the and as a device the late the analysis of the service in the service service and the articulars, late the analysis of the backson had in the analysis of the backson had in the position experiment to both houghts puzzles in design and the pozzles in design of the articulars to both houghts puzzles in design of the articulars to both houghts puzzles in design of the articulars to both houghts puzzles in design of the articulars to both houghts puzzles in design of the articular to both houghts puzzles in design of the articular to both houghts puzzles in design of the articular to both houghts puzzles in design of the articular to both houghts puzzles in design of the articular to both houghts puzzles in design of the articular to both houghts puzzles in design of the articular th

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Thanks to Monte Zarger and Dan Shino for their numerological help DO

125 CMV

# "We choose to go to the moon..." -John F. Kennedy







Three \_\_ewo \_\_ ma\_\_LIPT-OFP the rese of the grant latent V engines recomes dealerang or log glowning recker keep the lanch

arwer. Within minutes it has enough velocity to reach other. Ansends space program is handing to the neored- but for two years the Running have been working on a larger, more powerful reacher. Could have be secretly planning a measure three year to lead zero on the neorth Well have set there feed.

But: Addres's Resc. Iran Spece<sup>104</sup>, is a computer simulation of more's ground adventue, the next to the reson. It recreates all the excitement of every space massion using digitized locating from Mit-offs, space walks, limit had apps and a schedulewin.

As Space Director, yes have at your disposit the entire space inservances of both the U.S.A. and U.S.S.R., and an plan and detect every concernible space massion sub-oblicity obtait manuel and unmanuel, domain records, lame thyles, len taxic have passes, loant obtait, more landings, and even concentres whose tesses?

Too get to recent out man over 140 attronauts and connectours and themenane which ones how the "tight staff" Yao determate which space houdware to research and develop and then your actually schedule and isomets individual space measures







AS DOS Science Petieral

Hurg Alder's Ree Iras Span?<sup>14</sup> offers treasts different approaches to the mesor. Do you follow humany or do you can your own put to glowy <sup>14</sup>M the United States hard on the moon fust? On will the Russian continues to determine space and plant the red flag on lane solid fust?

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