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 The Department of Health and Human Services will spend the equivalent of the whole NASA budget every ten days Defease will spend the NASA budget every two weeks ? the assumption in the other instrument common by Arran Carl Transform entropy of the Arran Carl Transform entropy of the Arran Carl Transform In particular, Bill's uses at this debins proposed by Precident Carlier for the Areas Types (stati Academic Instances) and the Carl Stati Academic Instances and the Carl Statistics (statistics) contenting in a recession (statistics) contenting in a recession (statistics) (statistics) contenting in a recession (statistics) (statistics) (statistics) contenting in a recession (statistics) (statis

content increase in military sciencing. Io a total of \$146 2 billion, \$208 7 billion for the Department of Hoath and Human Services Gaugeaning numbers, bayend bue human competience.

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For example, many sciences have gree properties awaying that sciences the imagenet large rate wal in the new budget. The Mathional Science Foundation recovered is budget load of \$1.148.000m pairs in the percent instrained over last pair and manes the first time NSF's budget fest climbed above the \$1.260m few But the consulting times larger and any science of the But the consulting times larger and over the

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islavalaptrirent budget of \$16 555 billion is

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Ot course, these are the polaritistry budget figures. Practiater Carton and Congress are budly interning away, trying to produce in bedenored budget is fight militaion. But the actus where the total budget probably work of energie much it anything .NASA and Energy will be outmore deaply than Definite and Health

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"Auptor's Noveltect" is this marchis Seater column, within by Brish science wifer John Grobbin (page 20). This defing stated author has been a linequeric contributor to such publication as Making-Astronomy, and New Scientific Some of Getabars three notable books are Cur Charging Llowissis and, mail recently There Wapp

Stavelaw Lem presents 'Return from the Stars' (page 54) for the month's CIVER DARGING

Instein Colounder of the Polish Astronauteal Society and member of the Polish Cybernetic Association. Lem has written treny books among them. Solars, The Cyberned, and Star Danies

Another contribute of tecon (Warchama, Page 100) you Kiewi D.Donver, Jr. Bann in 1950, the Cleweland tothe has level in Seculi. Hong Kong lispes and New Heen. Connecticut where he now racides in Donnel mask his test shore locy sale to Another jin 1973 and hise amos appeared in meety all the mask research transmission.

Durapologies to O'Donnel and John Keefauver in our April Omnitus we nadvenently placed Dale Lerfestes picture of Mr O'Donnell above Mr Keefauver's name

We see proof to present a story by Arthur C. Carlie (Electron to Takes page 76). Mr Carlies sitest novel: Powellaws of Paradise, was a Userary Guild alternate, and won the Gallary award as best science-factor novel of 1979.

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COMMUNIC/ATIONS

He Makes the Law

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Geoffrey Edelhart Battle Greek, Mich

Yes - Fd

Pitt Falls

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Open your mind. Martin if you re not too shad of it

> Jane Held Los Angeles, Calif

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> David Palter Hollywood Calif

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Baublook lex

Progesterone is a female temperature — Ed.

Mister Misromer

The contoon that appears on page 125 of your March issue would have been very futny (load / would because I am a denist and boccure I resert seeing or hearing a service called Art (Galactore-This is an insult that demands an apology We demiss are not physicilars' but we meat particult we doctore.

> B Generd Messemer, DDS Farmingdale, NY

The cerecensist Yony Escott is English in English distints are called Dr until they have compliated their resolution; their they are called Mr Thus Mr is the proper talls for an English dijecting — Ed DD

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DALOGUE

FORUM

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Woodpecker Power

A teport in Continuum in your February Issue caught my interest. According to the fem: a woodpeckers beak hits a tree at 1.300 milet per hour.

Let a addume that is typical woodprochem head weight addue 10 accure The large inequined to accelerate the head to 1 300 pounds. (Strong nock) The kinetic arrings of the head at 700 mptin addue 10 500 pounds. (Strong nock) The kinetic arrings of the head of 1.200 points and the pecking rate of 1.200 points per main pecking rate of 1.200 points per main the power drowed as writing 20 homspower or ever 100 homspower per pained of weddepecker.

The hismelicing of woodpecker power to solve our mergy crass should be began at once. These or four woodpeckers could power a compact par by pecking at a smisted tee hiding work ingpact pastone A worm dispenser woold dispose a worm equiv so often to bead a beads intervent

A Prousent or so peckets would power an airliner and 50 000 would power a large electrical gammating station

We should proceed with cauton for the mitana energy source hidey under should be approximate the source construction and the source source source with a source of most probuse proceedy we control of doors in an their way clear through to go the prefer way clear through to go the prefer way clear through to go the Fig. Proceeding Fig.

Fredericton N.B., Canada

Froad with interest the comments of Mr Alton Wakestee concerning the impact wildoity of woodpackers (Protriany 1990) What puzzles me is not so much the strain 10 DWH on the nack but the impact of the brann in the brain cavity i was led to believe that one of the major problems with crash helmets is that, although ties can keep the skull intert nothing can be done to prewat the brain from pubercarg istelf when because of its forward momentum its challed as the front of the skull

What prevents Woody the Woodpecker from turning his brain into pure? Howard Soginur

Etabrooke. Ont., Canada.

Dr. Pring R. A. May one of the authors of the study child register. Whoever write the Pross release on the woodpecker atualy make a metalex statistic processing to the program of the statistic processing of the program of the statistic processing of the statistic make a more pleared information point in the conversion here to Essentially it have a more pleared information point in the conversion.

We should add, however that the 1 000 g s fgam alands as it was taken checkly from the paper's chain. In fact, competer analysis showed g houses more than taken. that high visione cases. The study indicates the bard is low brain weight faultice area more and its adding to barge as head in parkat alignment (whous obserging).



woody a miscarculatory but any remarkable

Am what enable it as what and such force. Apparently the great problems for a human brain on impact are its high weight /surface ama ratio and shearing forces in the tastus caused by angular fatoral mation — Ed.

Cheap Bhot of Healthy Skepticism? Irreport James Pand is healthy skepticism in his Continuum report on the Tendeanduntal Medication lexitation counters (March 1980) Howwar Randi may have created some misochospitichs which I would Not to claim up

First the TM investments not a church this is an easily seared completely normal goust schmass whose strysnological sorphratogical and socialized branchs and same welled experiments at several unwastice. It is experiments at several unwastice in the closed blark many people assume that rid gion is involved just because the learners in structure and because the learners in structure and the several sectors in the several unwastice.

As for the flying bechingue is all it is true that foam nabber gives the flyer an assist but the barn is not necessary. Here, lifed off in 8 stang postion from my leng-roam floor: the cappet centrary wasn't assisting mell. The loarnin your photo is three for protection in the event of a hard land

No one technique costs \$1.500 to \$5.000, the price range quoted in the article. That is the cost of a whole course, including leavieral techniques and excellent room and boald.

Finally the EEG of people practicing any of the advanced bechniques show markable synchroticity between the optimate left helves of the brain indecating integration of the creative and analytical ways of thinking. Also much back oparatinistics a supposed These are the brain labormalities that Pandi markins.

> Roane Dantzler Growtbelt Md

Is if askeng too much thet your magazine be accurate? I refar to an termin Orary a March 1980 issue ontitled "Invisibility Lesions. The Transcendental Meditation community reliating.

Albert Einstein on space:



"Look to the heavens and learn from them."

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WHERE EAGLES DARE

EARTH

By Kenneth Brower

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Our keyek was built on an Aleut model, designed for the open coser, but enormous seas come up suddenly in the Guil of Alexke. For safety we hugged the store staying within the kingdomol Helahelistic. The sea wake is pormativia



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PET DREAMS

LIFE By Dr Bernard Dixon

In case and dogs chann? I iso, what to they cheen shou? Anyone with heav witched a dog usering in incort the Ne subserve hand. Iso power and part in approver pursue of something target will their therein an obvious answer to these questions. But landancy to anthropomorphics, they have landancy to anthropomorphics, they have forg no solid the interpation to isosame that our persident way we do.

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Journers depony has come from desireira praish have austand damago to put hal peri of the term fissie imported in protein all strain. Inverse other way this war come? They at piles and betwee sources, period ware trainer and betwee sources, period ware postaria aleman prevent data postaria aleman prevent data postaria aleman preventid. The annual locate of nervaning in a writing state. horizontally or vertically as if watching something, it may stand up and waik eround, appaurity stalking prey perhaps attacking an imaginery mouse

This each bahaving in fharway is assurably not awake to pupple sime conend by a third (inclusing) exelnomisis a class in floation of dap similar The call does not follow moving objects placed in front of 4—not even a clead or "play" mouse PDO waves bah however, be reasoured in the among bahar What we rearry is MPM steep, but what we rearry is MPM steep, but what more played in formal.

Acchiertype of dwam balance commonly observed in these animals is growing. The call will lick to take a for example. But even here the action is abstracted. Skick is preced paper to the ostic tar and the call will ignore 1. Try the same thing while the call is availed and it will attempt to enrouge the offending object.

Journet believes that damage to the brain region responsible for postural alona has "deinhibited" is repertore of activities usually writibited at the upper



Stalking and grooting als per droems of calls

signing the spelar cost informary, partyr, the spinling of any and proorning, an instructed to the charaming calls butin. Now we can see from, although the animal remains as soundly asilters in balans. Further control information contast from the fract that drugs that suppose FicM sites (e.g., the antibactic charamplericos) when short has sharing behavior.

These are two possible explanations for update at the PGD events interacting data at the PGD events interacting data at the PGD events interacting the possible these tasts call. Indeed, the bases in the the schedule indeed, the bases interacting at the possible dearming involves looking as pollutions. Several researchers two expolled comliations ableweet and by events there able the schedule of the matta and the schedule of the matta and the schedule of the world and to be reacting according the world and to be reacting according to the looking and the schedule of the world and to be reacting according to the looking and the the matta and the looking and the the matta and the looking according to the looking to the looking according to the looking to the loo

In the state if epoct (Lends in Neurosearces), 2.25(). Joint en types that is a second of the state of the second second His thereing in that rapid gay movements may begin 20 minutes before the onset of PGO waves. Thus, they cannot be a response to visual haltboards on generated by those www. The starm's beam that generate PGO werks are beam that generate PGO werks are beam that generate PGO werks are increased.

Non qualities then environment the attention to work if standard in glubals. What is the code through which PGO was carry the nativation of Anthone massages genetically programmed? On massages genetically programmed? And the standard in the standard in the massage genetical programmed? And determined in large part by receiver note? To add continuent to uncertainty casewrittens of directing more can be marked on support either view

Navely 2.000 years ago one of Nero's courters, Potonius Arbitec works poten in which the doser well "in caracia in acrina apous weaklys lucata" ("and the dop in sized traverases the tracks of the have") We now know this is that "where work" know that the institute "that we don't know its weakther the hard's tracks have to be real DD

JUPTER'S NONEFFECT

SPACE

By John Gribbin

Si y page siga is book writen by available of the section of the section of the earthquele in the productor was been all the productor was been approaches intered in the productor was approaches intered in the productor was approaches intered in the productor and major cut the available of the productor and a sign productor of the writing end, device and approaches intered and approaches of the major cut the available of the productor and a sign productor of the writing end, device without an own makind for 3 ber or maily wags

These bad news for the docreasyers The book has now base proved wrong, the where base of the 1982 prediction is gone I should know I was coauthor with Dr. Stephen Phopmann, of The Japane Effect

Because of the way the book has been misseed by out lifes who main enser have east 4, want to make a clear that there is no masson away to expect any unusail service disturbance in 382 from the causes given in the book This does not of course rule out the potentially of bag entropaysee them But / you want an astoological practicion. Tam attract you are going to have to asis commone elias. We say with D Plagemenn there in the Charles otherwise the say of the plasma say with the charles of the plasma say with the say of the plasma say with the say of the sa

Then there was the straightforward geological evidence that regions slong the Sen Andreas Fault are decidedly overface for a major distubence. The last prest San



Juppier is gravitational pull might ingger graves on parts - or so soleness mesoning suggesties

Pipesce anthrushe occurred in 1907 Actile monther heavy of pile lactoria hills of half the costal ingo of a Call forms in the pile bishic on the lact heavy in the sectory of the lactoria heavy of the cost of the cost of the lactoria heavy of the cost of the cost of the lactoria heavy of the cost of the lactoria heavy in the sectory of the cost of the lactoria beautified for the lactoria heavy of the lactoria heavy of the lactoria heavy and the lactoria heavy of the lactoria beautified for the lactoria heavy and the lactoria heavy of the lactoria beautified for the lactoria heavy and the lactoria heavy of the heavy of the lactoria heavy of the lactoria

So where Steep Phagemann and I put home the process of coulons applied, will regard of the San Andrees I has how barding up a manuse strain, could be happened the San Andrees I has how barding up a manuse strain, could be happened in worker movement the mat has been applied to the san applied of the barding strain and the same strain bard to be the high poheses was spechased by the high poheses was spediate bat more special barding the bard to be the high poheses was spediate bard the same strain and the same bard to be the poheses was spedentiable them to be poheses was spediated barding the same strain and the same strain and

To dottai, we draw on a theory that the sums achieved the tophy the "year" long "sumpolicycle" is modulated by the bolos naked on the such suffice as the planets move in their othis Since Jupiter is this bigging planets in the solar system. By fair it worts the grounds the fluores of the solar tod. So we took its name for four familyoltical theory.

From 1960 on, the varying hdal pull of the playets has been vary marky in stop with the varying looks of Sungpol softwity Being young and perhaps a little rait. we were embodiesed by the bit owthind the table curves forward and pick out 1962 as the likely darie of the read solar macmum.

The fidal theory store is really only good anough to forecast a movemum sometime between 1980 and 1984, but we got really committy ourse; st

STORY TIME

MIND

By Renee Fuller

nos upon a time when we were young stores bacame tentoly moganizati. At about age two we began to capielour assents and other actits to reaction us. Whoally overright our largings capability explored. From alwe words we lesped to ather sentences. We became writed communicators

Many of our first short sentences were actually ministrue shores. Just as adverlight can be their take in 24-accord apignans, so could we as children Could storytelling have been the basis for the verbal explorent?

For 50 years psychologists have been search right the leapsing the base ben of learning that would be for psychology which be darm weaks or drystes. Psychologists have searing and eventher which is darm way that have have not because thy weak eaching for searching to ornal and extension. When because they weak would all the unimental extension to be an eaching for searching to ornal and extension when they doublic they extend all the unimental extension that have not an extension that the they for the they we in that daves enclosed. Promite distant jungles of Naw Damas, to the means progles of Naw Kirk ghottas whatwet their have been people. Today the gravitationation of the term Today the gravitationation of the term wears—united subjects and the term ingiting as millions worth with million theranitesees floation is used at the term of the term of the term of the subject is subject to and of the term of the term of the term be negative is searching.

Since result the deamont humanity we have oxupit to exclain our existence through strates. All clubications have expressed their central beliets through myth bolic mythe from simple legislical of goods and deamons we have progressed to the more complex tables of screens, whose coemological theorees contain the ultimate stary of the ultimate.

Looking about follow creatures on Earth we may wonder at what exclutionary stopp the stary concept developed is it unique to humans, or does it have anteopolimit and peralets as so much of aut behaver does, in other species? Aren it fregement of cetch-and-frech, tigs and hale and



wany day markete chaptrant bo lead works. An intelligent dog for example, can comprehend as many as 50 to 100 words. Skill our communication with animals is primarily nonverball assuming the form of a charade

The spis, however mix provide 40 interesting acception in mooth years psychologistis claim to have found ways to communicate windby with screen by a Scientists at Emory Drivensty in Atlanta, sught a charance for communicate by preseng computer ways. Three other sams count has a fair hearing American Sign Linguage, their asket produced eventmones account

None of these meetigstost, however here done with the apeal what avery parent does with his child tol school Would the apeal listen to school? Would their vocabulanesi, iku those of children, explose? Meal important, would they attaingt to tell the schore to each other and to their horzen (sends?

It wouldn't be a difficult expentitert. Once an animal has the vocatulary of these spes, it could compruhend a signal that is and etuman companion were entering game time, that what followed would be mate-below. In asimilar way we in micraise to officien that we are entering verbal make-belowe by beginning with Thoma upon a time.

I contained watche results of such experiments would be Il would be laternating, though, if the chimplanzees actually did understand the stories initiating the beginning of genuine training as we know if

Delphins would perhaps be likely candidates for such an apparment. That bians are begar than ours, and delphins make all sorts of cuncus, complicated noises. Are these noises the islang of take? Are delphins the poets of the deop?

I would be very much supervised if unslighert animate could to liaim tables and tell them back. Tithink the problem in achieving this lies with the scientists who are uncomfortable is staryallions instead of with the animals



In all ages, sloves have approached the most reduced and effective way to share information 22 (1999)



The future is coming. And with it will ocene great benefits for mankind. And a whole new set of problems. Because we ere a torest products cenproy, and plant seeds that there up to 50 years to become meture trees, Champion Internationel has to think the sense the future. We dill les as share and the sense the sense of the sense to the sense the sense of the sense you make intelligent choices in the years to comhere is asomething you might evant to think ebout.

In the future, a new science called gene splicing could produce miracles—like the regeneration of limbs, a cure for cancer, even the flowering of a"better" human being

But who is going to decide what makes a "better" human being?

Some years ago, a child was checked into a hospital; the tip of one finger had been aliced away. The wound was dreased, but the patient neglected. Days later, the dreasing was removed. The finger tip was growing back.

At the time, regeneration was a baffling and spooky phenomenon.

Today, we are beginning to learn more about it through the science of proteit engineering. Genetic engineering has the potenial to alter the make-up of mankind as an other acience ever has or possibly ever will. Gene splicing, one supper d that sue we science, is the transferral of genetic material from one in a batterium, start a whole new process of organic removation.

The realizable benefits of genetic engineering are both stunning and myriad.

Splice a gene that produces human insulin into a replicating microrrogramism, and diabetics have ready access to a purer, yet less expensive intails. Researchers have already synthesized the hormone responsible for human growth. It's increasfor human growth, an immediate boot to children with stanted growth. It's increasingly likely that gene splicing will be able to mass-produce interferon, the anti-viral wooder drug that may put the brakes on flu, hepatitis, and certain kinds of cancer.

Eventually, bacteria may become assembly lines for the creation of whole new life forms, including "better" human beings.

In the long reach after his own betterment, man has covered incalculable ground: from primitive man domesticating wild wheat to his use, to modern man on the threshold of making a better organic soif out of his existing self.

The promise for our future is almost beyond comprehension.

Which means questions have to be asked (and answered) right now.

Most critical: who is qualified to decide what makes a "better" human being? Who among us has the capacity, much less the right, to choose?

Also: what safeguerds will there be against bacteria containing poisoned gones escaping from the laboratory and contaminating the very life we're trying to improve? Can patents be awarded to private industry for what is essentially life itsel? If an can beince retain its necessary purity and freedom in a commercial situation?

These are questions that desperately concern us all because we are the subject matter.

If you're concerned with the immediate future, and would like a bibliography for further reading, send for our free brochure. Write: Champion International Corporation Dept.200N, P.O. Box 10142 Stambord, Connecticut 06921

Write us today. The future is tomorrow.

Champione forest products company with its roots planted tirmly in the future.

We serve the first provides business weighted how growthate business busines and term hoat we make soud business and populations. First in a good for anne and business and paper packaging for thighing and selving Business we make an long how the forest our second cleanche, in one way or another on the busines. And we re tablement work for the first



THE ARTS

By Michael Shore

regress in the physical and mechanical sciences claiamines a propries in art "-- Composer Carlos Chavez, 1967

Though a number of other hindres threaves. These services in right and early clay. Exerptinesyou look young poor missioners are merginal calabia advalaway sector. Mit more the angle advalaway sector. Mit more the angle advalaway sector. Mit more the angle thread sector advalation of the sector of the sector. Mit more reserving if fully product has arread thread galawahas advalations are selved by the advalation of the sector of the product has arread thread galawahas advalations on Sector Sector Sector Fyred Lizzanis' Woney' and Galay Namaton: Calar 's

But wait Hearn trook and reil always been based on relection// But in the election point in permit extra full the election point in permit extra full being the sophetoxite interacting studies that depand on were explaining studies that depand on were explaining studies that depand on were explaining studies that depand on the explaining studies that depand on the explaining studies that depand on the explaining studies that and whet have pous altored new features synthesizes and mystad other forms of electromic consum? Yes yes, yes, and yes But nonthen's something new happointy. While gathesizershare been with us a good quarter century — even since Risbett Moog and Donaid Buchts smuthereously created their own shrup's differing whintes — too-and-volusershift society regarded the instrument with a high degree of evencion.

Why the change of mood today? Bacauce, torone timp in these post Hemosury, pre-Apocalyses times, main by high toor, a workshole synthesizer can now cost less than a comparable electric guter throughters can now cut their teach on classes that 20 years ago were a clearn in some MIT engineer is way

¹ Look example you: Jedvise Lary Fail, who programs and pays complicated systhesizes for such tap-selling sch all Hall & Coless Bus Scapps, and Peter Gabail (whose brand strinus; no doubt a degreed by the current crop of alloch-spanne). Tablesion, silephones elements of the current crop of alloch-spannes, recording subdos elements of the current crops. Addres elements of the construction of sold.



Gary Norman Something's going on this you due Lindow what clus do you all hecapy to came

and inhumen or something is like burying your head in the sand "

The share of the excision structure of the sound of period structure of the sound of period structure of the sound of period structure of sound of sound structure of

In the Suace synthesizers were denniky released to space, 914cts Then came the Saventee with all hose English classor onck carpe, hiele his sud Emerican Lake and Pathat, who used entropy and the same series of the same legitication as determined to be calability in conding. No wondor electronics were shormed by those means the same shormed by those means the same shormed by those

Is the meansine flough, or the tropes of a compliance approprint rock in based on the second secon rhythmic, with percussion provided by an investigive process machine impaid of by

Succe's 'tunes' were short and to the port the port being the effect of directly into the homitically clanking Star Records remains a masterpiece of

machine-oriented sound took off. It tinally did so with the margin of tour German computer operators who called themselves Kraftwerk. Their long United States in the scring of 1975. The der Aufobahn," with gentle, thumping electronic anares, burbling invitim bores wrft rames the Can Neu La Olasiaidori and Tangerine Dream

future-shock implications

infuential. It instigated the direction of David Bowe's most recent albums. archd feltante and normusioan Brian End However Engineering desceipe himself, he is Electronic Rock His Another Green World box and synthetic percussion in pestonal the synthesizer. Enc showed us how to live

Ergland While Americana had reworking-class you'r, there was disco in the United States is comparable meanly mindlwody mechanized dance and throughout the pounitry While punk warfed to 10 the system to streds, dispo and disco were equally subversive

was in fact oute well thought out. The Geroid Moroder and Pete Bellotte who rencately ananced synthetic patients of are timed to the booty-shaking synapses ontenion for danceability was the result of Moroder's antergement of Donna

(Deevolution Band) from Akron Ohio is come on stage like chemistry class nerds is set to an unrelianting robot beat. Even from Citrig, Pere Ubu has been openiding Reveneteen. Reveratie nitras sangle hardedy bridged the gap between explored the pure sonic possibilities of distant. haž-remembered factory wheaters organing orders, seens, makero palatable

And there are many more. Batches d



Dwid Convergiern electronic Flerig Laped

albums seem to arrive weekly from France, Germany Great Britain and other luturists at punk and import shops. Why all-electronic rock combo the Human Leadue was puoted recently as say no to the whip Electronics are obviously where

Reproduction is a good example of the "tou've Lost That Lowno Feeling ' Spector new attractive. Whereas Spector made the new electro-pop's vision works according

electro-pop a meldle of the road. He electronic hend a perfect, dependable

cold, unleeling, noisy nasty, and dischonic rock represents a deturbing cry it implies a leap of lath into the glearning

"Logithe clas for writing Meta/Horn reading is magazine, Numan says on the subject of his latest hit "It said some a mechine waterg it could be human, have friends, babes, and such imaging a

The cickety-clack of try metal fort CO

FILM

THE ARTS

By Jeff Rovin

Conference a traffic also believe the barrier of an another also believe the barrier of antire yeary shift of barrier to denire to denire the working you believe the sole of barrier. A sole of the sole of the sole of barrier and the sole of the sole of barrier. The sole of the sole of the sole of the PTS (Provisional Traffigment Barrier) PTS (Provisional Traffigment Barrier) and other bascing of will and reterment the barrier barrier barrier.

No worder the PTIS has evolved a contingency plan to dress people in flank, steak, lingume, and romaine fattuce

Get Smart is one of the risot popular television programs of all time. Ceased by Mel Brooks and Back Hearty and comitto association and the strategistic common association (965 through 1970 on milliosit lidencias) and the strategistic composition Adjume as Smart, Bertown Findom as ma Jorng and patient coagent 99, and the Lide Ed Platt as the clinet. New University Polycetystes brought Cline Adjume as Against 85 to the big screen in The Nude Bomb And while Agent 99 is gone—septimol by Smart a baselful inee adds. Agents 36, 22, and 34—the picture is stocked with everything audences have caffel to expect from a Maxwell Smart adventure And then some.

The shope of this organic De Shaur Fals on De and sharped and site sharped by the Deposite of The sharped by the sharped by the deposite of The sharped by the sharped by the deposite of The sharped by the sharped by the sharped hyperbolic sharped by the sharped by the sharped by the sharped by a sharped by the sharped by Sharped by the sharped by th



Dox / dense as Maxwell Singet Agent-86 of Get Singet convertionite big access in The Nude Bonds 30 Chevi

And all occurse show are paped in more here a two Chronic with which the Nauk Bentre parks to proceed with Data Mark Stranger (1) Tablechtage to all the reliance of parks promote the show the stranger of the show the Data Mark Stranger (1) Tablechtage the show the show the show the And the show the show the show the Mark Stranger (1) Tablechtage and parks ministry are parks in the the show the show the show the Nauk Stranger (1) the show the show the show the Nauk Stranger (1) the show the show the show the Nauk Stranger (1) the show the show the show the Nauk Stranger (1) the show the show the show the Nauk Stranger (1) the show the show the show the Nauk Stranger (1) the show the show the show the show the show the Nauk Stranger (1) the show the show the show the show the show the Nauk Stranger (1) the show the show the show the show the Nauk Stranger (1) the show the

Describes and a low 2 low of an index of the Minnowski how to be the second s

Adams agrees. "The whole secret of comody is that you lead softeone zway from where you're going and you calch carriesto de Male 16

UFO UPDATE

By Charles Berlitz

nos Chawlert is a French

Bedity Mr Chatalant when you were at Chatalais: No Effeet years apoil did not and to admit that it dows not know what it is these worlds test by isterang to the the kind of message that would have the Beritz How were the messages sent Chalelan They may have been contained



These were 76 UFO landings in 25 days. from September 24 through October 18 of recorded the type longitude and latitude

exact multiples of 21 centimeters, the Beritz Why not lace-to-face contact? spacecraft that could even try to reach spot. There are only two possible explanations. Eiffer fying saugers do not

Chatebarn Along with several French think that UFO propulsion might be based Chatelant What is mooriant is not whether why they come and visit us now OO

LOST IN SPACE

Ine issurching of a satellite loop an event of coarsusoprificance, is usually trought of the reversion hingcoard these days. If he there all statellite are certain group complicated them a log blowtorch brackoff Farminahy beekds yeers. To the increase 4.555 main make objects now a roth are added seen month half a daten from the Server Lenor and another way from the Linker State.

But the implancy of Statem 3 is communications, satisfies owned by PGA and berr into outside. Develope by PAGA from Cape Centerman. Inst befrom the most an usade duporationate in a global based with the service analysis duporationate coording placed is orbit. Two environmental based and based into the communication of the service and the service and the service of the outerhal analysis of the service and other of the outerhal analysis according to ASSA, was present this when we handle in the service and ASSA. Service place the service of the outerhal analysis according to ASSA.

As on previous occasions, the NARA controllers transferred to RCA instructions in Vercini Vallay, they January attempts to place the autilities in prostetionary position on or incontrol an apage of 35 KBB latential. As a walk to use in they on Statement is only uses RCA stating is advirtual explanation, but eather interingly and the statement of the statement of the statement interval statement of the statement of the statement was Bay II was green.

A tot of catellation available by this simplate revent (the first loss out of proving) overface totaling) totaling from power to communications As an asampta the Katel American Am Defense Command (DMAA), distance with a leaf total control of the available and the sites, could find no mode of the available authors in the wides, could find no mode of the available authors in the wides, could find no mode of the available authors in the wides, could find no mode of the available authors in the wides, could find no mode of the available authors in the wides in the wide total colors wide mode of the available describing the sevects is like 'looking' for a gain of fiscal on a buildoom foor ...

The grain of teach is a box about the site of a household withgeator, weight 907 kilograms, and is powered by two tetended tectangular wings with seven square meters of shicouroake cells. Hold Sattourn 3 been enhanced by some evolution place of ind-inclogy unlessed in spore, its disappeature a regimtrave been attributed to an envely Bait the herdware and the isanch system were by the standards of this industry well tested The fourth was the one hundred fitteling performed by NASAs Deta System. The hardwalls, used in previous satelliter was designed to carry 1000 voles erouts or one other baseware forstmission on labels of 24 charavele. Nothing new

Amost two-months after the Cape Converse transit IRCM envariant "Low hands all persisting of excerning it is using condition have been extracted. There are term body singing at the way to Logist of London's instances campar and lower to \$20 million pakey to cover the costs of contracted and on the \$20 million pakey to cover the costs of contracted and on \$20 million pakey to cover the costs of contracted and the reserves. BCA value to at \$20 million such of a program of comer bayment isosiati could be the laters of the rewest Batcomic performant singapon

Loss of a Societtian supertrivier and its cargo is treated by the motion as a training the second s

RGA put forward threa theorem to account for the loos of Stotom which disappeared while saling aining its oursed path alsost 133 degrees well lang stude above the equator. The alsorations accounting to Will arrange where its way out in space. It shot beckning the attractioner and burned up. Its skil out here built be vised within and avoiding.

¹ How reliable are owner communications sublitized Attecution RCA managed to issuage the period of strate of in outcomers by learning space capacity from AT&T the unaccountrace and of allocam has considered and account basite launchings in the minute of those minutes and insurance executives who foot the big bits — ThYOMAN O MANLOW

CONTINUUM

HUHS

When the proversilisant Newton on the twaid incluated synchrometreenante part of the leveron. Was twenrespectements (they dead read a brann estivalitie) overhult? Sender som at Deaven Marta obses and Deaven

and a strate of a strate of

sumes would prevent the MMON builds says to would the spaced the warm broad with social. The N400 wave inspuely reflects a reproreserve and social social according to the UCSD acresets which occurs when pulper by to somact mean pulper by to somact mean pulper by to somact mean



Brain weven being studied in a charaber sheided egatur patrako, agarati And now expanse o an electrocerebral double-taix

Hillyad of the Linerinay of Indeform all San Diago (LUSB) Scince of Medicinethey South rest the birsh pate state appendix spreak 400 spate state appendix spreak 400 spate fills and spreak spreak 400 spate fills and spreak 400 spreak

First-complex Tellion a namb lease with french See Levels and second

This discovery could help in the evaluation of reading disabilities in children and in discovering just how much the rest of us understand and whate we go wrong when we don't

Elian Bilgare

Tou estays have seasone or you don't and if you have if you an oblight fo accopt the surprising and dealering parceas of information and the ownerkering and upherining ones along with the mark and promptly upacture pain.

-Lease Thorses

BLACKEST BLACK

Like many other important scientific discontinuit an almost perfectly black surface was found, incidentially by a reassister working on something else in a laboratory

Comparison do cabilita a critica de la comparison de la comparison de la comparison de la comparisona de la comparisona

Whet had texpensed was inst the 50 percent mile and solution mode any vellays in the coating during the inspense process. These we keys acted as light traps – etera gight in but for coatiter displaceds in the ground Stapping the procress after 15 to 20 second yeals the basit result.

The decovery has m portary explosions for astensory statementy and other spences that depend on the absorption of light Previously the best black coarrige absorbed 39 porcent of the light and reflected 4 percent ai24 bit 3 hours A surface that bitsorbe gets 5 percent has a 139 bit 1 liab prevent has a 139 bit 1 liab resolution of distant stars by electopes. Not more accustar metasurements of light energy by recloneaters and a slightly greater afficiency for solar collectors.

Johnson said more than 200 astronomical graups pace physics labo and amiler organizations have extend about the discovery Short Demons

It is the customary fate of tew fruths in begin as teresives and (u and as superablics)

> Thomas Hoaley apartiting on Darwin a Origin of Species

These who apeak of the reampacts sty of scrence and responsible which it owner saud or make which it owner saud or make which it owner saud or make which it awards.

- Rone Rus XI.



Seavoing Nestron recorgoight of Jokeson is block nonlinem

SIPHON BURNS

Yes another problem is now rang out of the energy ones is gas suphoning burns. The American Dantal Association (ADA) womes that gesoline can burn the delicate tassue inside the mouth productor sweller. Upwnisand penodonial al Ohut A Force Base in Nebraska Tho middle of his polate was solt and spongy with twy blotens

similar purvic can recur from placing aspirin on gum bases to rate vice bothache, from an allergy to mouth watch or footbaatle, or from a



An all-soo fanvisir scene all the energy cricis: Gas sphoning, beside its legal problems, can lead to a mouch full of late olivers.

ichster and lessons

Recently a tarty-theseyear-old US Air Fooce sergeent teptoned gas from one of his care to his other car using the old-fasthored labe-happens, his got a mouthyl of gas. He sport out right away, but he warred several hours before merig he mouth.

The read day with a burning parent list mouth, the work to the dentet. The root of the mouth had a lot of it to users and yea spets almost like a burn-kind of had and pathy' says Dr David L. Haffman, enclosit siew of other imfants so dacress is difficult

"He happened to marton that he had aphoned gatcline the day below. Dr Hofman says. "He was lucky Gaschine is very hoad if you inhere in and it could get down into your lungs if you couch. That could get sail."

This servicement was heeled within a week, but the ADA shill brands gate/inte sphoning as a heelth hazard — Ridavit Brady

SKY-HIGH PLASTIC

Passenger canying amplanes made almost completely of plastic may cruse the sky in the near future perfected aupersonic seconds

This prediction is based or cooperative studies by the Defense Department, NASA, and some major ascrieft pomotariate

Requested by Congress to study technologies that welcare hall consumption, NASA suggested, among other ideas: utilizing plastic composition anplane construction

According to Michael Soft Indi manager of aircrosuucal structures for NASA, the industry is already accoloral plastic in ampliane construction. Such materials cays Saliviral reduces the cont weight and tell consumption durated twice improvtion durated with an

Starting in the 1960s antall percentages of plastic parts were being fown in milkary avoratil. This practice grew in the 1970s, with airines placing a few princip components in commercial aircriet.

The prognoses for metal substitutes in the next decade "will lead to deve oping composite verigs and fuselages for ecompercial transport, anys Selford

When can a passenger expect to By in the contines of predominantly plastic air transportation?

The technology should be available by the 1920s, but the market reachness is not so obvious

A womaning of the fuel stuation however could faree more report introduction of pitotic technology. Satiand products "The operating costs of old ar-

A candidate for corverson a a future supersone cruise transport if a deer son were made to build the place perhaps in the year 2000 or soon thansition as much as 60 or 70 percent of the vehicle could be made of high temperature

A large scale model of a highly maneuverable plantic arrowt hange beneath a parter avalance from which it will be dead instead

CONTINUUM

BODY MOVIES

First them was the X may then there was the CAT scanner which shows x may cross sectors of the body scan of the same brown vouct show nothing be cause metabolism has bornt to a helf According to Dr. Michel

Ter Pogoessan director of



Methe 3H Podosi an and ba PETT Unlike as preperties to the DN seamor c shows among other things that a cooper is dead

and now there s PETT This latest diagnostic tool shows x ray movies of the body s biochemistry

By inhoducing indicective tag substances such as glucese or oxygen infolia person a body doctors can actually watch becchemical compress in handwork become sue – in the heart or brain for example—on a TV screen.

Developed at Westington University Meet and School in St Louar the PETT devicers warming sophisticated than the CAT science because i shows subble meabolic hanges going on meade liviting organic for insknow a CAT science to serve an instance while a PETT the diversion of radiation tool encoge at the university and the perine pail inventor of PETT the diversion exoket by measuring the cancertration of the radiative tagged substance and them relaying the measurements to a timeful ecompart. The computer in turn reconstructs Peers abstract measurements into mapage which are physic out in oper on a TV science photographied or even visiextrapol

Though skill only a te especification to PET recard per could lat cloctors working person's brain machani while or open is tablog naching or gean theriting. It could study the brain for turnes or the cleanage influend by a stroke and then evaluate thetapies for those condtions. It could yield insights into everything from schizo physics to Huntington's chizante

Similarly a PETTisation of the heart could help a doctro simport exactly how much damage thereas in right down to the callular level. In foot DP Ter Popogesen noises doctors wither mailcoal school save a trooply begins to use of the way on some of mer near the trooply could be part of the mail and to the PETT scamper will probably be part of the mail as to simpor hospital in the nation 5 larger hospital in the waters in the troop size in which the troop size in the troop

SOLAR PONDS

As one of the first aliabat in turning off trials: dependence on high priced imported of and suming on the files and terretesis power of the sun loracel scientists have ball a.



target Dead Sea solar pont of shown with beavy plack invest

150 «/owatt porkt

Page of what the leavests say is the world is largest coline electric power station the 0 8-hectare pond is a man-made climplicin the earth september of users for earth's rays that beat cliwn on the Deard Real area.

Developed by lateral acpresets Dr Puscich Bloch and Professor Harry Zatakes and the shallow pand test has no batch, curried with advance to block, curried with pond is of block, curried with pond is of block, curried with advance. The test is a bottom layer is extremely safety. The rescond layer is front work which will stay on top bereamend with the

The solar pond works when suright isteams down through the uppel light of own water and is absorbed as heat by the black pand immg and dense layer of sait water Gradually the heat optimums to build up, wanning the water to read the boiling conf.

This hot water can then be pumped out to heat exchanger units, which in tass spin electricity producing tarbetes

Security's have alivably produced an experimental extensional point in addition to this (50-kinear) model. By (80) they hope to have a bugger 6 megawatt point working and by 1985, the test of a sames of 20-to 25megawatt plants — DC

In math, the command marks derived from science boll down to a diffuse pervisive fear

18 0589

FLASHLIGHT FISH

As long as it is got its bociers, the fisshight hish new hist to worry about geting batterise, says one Unworsty of California microbiologist-bacteriologiat. As part of his research into what makes some opean dwellers. odd thrigs about the tipbactera partiments is that certain bacteria cling only to certain space at other than Another strange thing soeffects at the twen tip uzzled out is how the glowing bacteria stay intact and unpollated by other stray bacteria.



Rashght fish photographical under whered light her a luminous organ under sech ave. The secret is a finerally gapple of because

to litranous researcher Kanhath Nealisien, di his ustversity's Sonpps Instaution of Creatingrephy in Ladelle says thans 's a whole tenied of glow-in-the dark sea creatures that get their light from hischhiering bacteria

Nestion has found these s an exchange of beenetic, a symbolics, bokeen if he would creature. The bits of lines a assembly such and secure home for the caloring and a source of nutreens. In robust find glow which the bits our hed glow which the bits our go ofter lash to within state. Inguing on communicating with field on that want to east a set fighter exemption.

Nexision says one of the

multipolic restant in the faith body the lets the boarteria, glow without interference. If opernistic occurd house call whether is, single Neetloon, they might ben have a called how our bodies level under control freegn bacteria and why this system of care sometimes basies cover insulargun deverse — DG

SEX EASES ARTHRITIS

An increasing body of evidence suggests that sex

Dr Jessie Poter, director of the National Institute for Human Relationships in Chicago, says that assue activity stimulates the acter rat clamos to release actiorat clamos to release action bonal contracrise which reduces pain and swelling in inflamed joints. Contracris is sometimes given to arthritis sufferers by injochan

Dr Potter cays that any land of stocast argustal self-structulation, petting, ora sex — evidently leads to contache reliefs of Those without pathers don't have to leet left out

While the National Arthritis Foundation insists sex alkavitant be considered a tocathient, up to 70 percent of the arthritis patients inforviewed at one Perimpliverse medical center reported that it had helped

How long to the soof ang effects last? The prescription is similar to that for pen tabtists. Take one every four to six hours -- S D

LIFE ON MARS

The controversy over the on Mars signs on While scruthking space relayed from Viking space costs which plopped driven

on the Red Planet in 1978 scientification detected on Martian rocks spots that appear to change opior

Is there any visual ovdence for biological activity? The question comes from Glibert Learn president of Maryland-based Biosphanies, Inc. along with collogical patients. Inc. Stored

ingues Patricia Ann Streat and William Benton

In examining color images transmitted by the Vieng I Mars probe: changes in the location of greensh rock patches and ground patterns have been observed... the team reports

A biological process

abons Lewin summers Glitthes in the Micros

caheré and processing system wind-blown Mars duar, or simply sursight playing upon the rocks are potential our transported.

To support the life hypothess, the sciencisk observainst antihy samples of algale lather microses and other organization that be inhostie eah-insteam that be inhostie eah-insteam that be in the of al-terrotical, undergo eaks of the grow of delin table industries thatgrowt digala wave found in Antartics rocks once thought

Boccuse of the limited resolving power of Weng robot yets and a tendency to see even color differences than the human eye detects an asswer to the phenomenon reads further analyses.

As one of the philoppoint visitigators on this Viking biology learn. Larvin argues I think it prudent for the scantific community to keep the life-on-Mars guestion goen '-L D



Maxien social Three experts say they se obasiging color

CONTINUUM

THE HELIUM WASTE

Height which bucys belbons and birrigs and is vital for lubure technology is being washebuly writed to the atmosphere by companes with no current use for the nonsenewable resource.

Nonfigermatic earls capatic or making magnitist and motors support learned table take typication in the second learned table take typication is boing lost optication table and table table participation and table table participation and table table optication and table table second software allo being agent on table table table table factor and high social

receiption to poenality

About 15 billion outer feet of helium is being verted reach year as a by product of natural year of helium outer works is largest are nishmatical at 175 billion outer lists. The National Research Council eave contrauted visifing could deplete 85 percent of U.S. reserves in approxmethy 32 verts

Wothen sre much faircair han men. Nobody has ever erer us weapons for very ang. have they?

Margaret Mead

MURDERED

There are two kinds of people in the world — those who understand computers and those who don't. And the 'don'ts' are beginning to light back — with a withnearine reserve.

2.3.9 (V Delotion is comcenter registri in the Link workly) of Mannesona, inse door member supression takes to contra Linked States Fior suprational States Fior suprational States Fior and a computer states and the suprational states for the suprational states for the suprational states for an assessment in a supration suprational states for the suprational super states for the suprational states for super states for the support of the super states for the support of the super states for the support of the support of the Mannes for the support of the Support of the support of the Mannes for the Mannes for the support of the Mannes for the Mannes for the support of the Mannes for the Mannes for the support of the Mannes for the Mannes for the Mannes for the support of the Mannes for the Mannes f

These also only the volvert asky EU-docer i impliquedo to somula Marco commonly asky EU-docer i impliquedo to the source of the source of the common source of the labor nor the system background asky asky asky biotectory and the labor nor the system biotectory asky asky biotectory asky biotectory

program at MIT specializes in training managers to deal offectively with the stasks



Computer user goes berseni. The reformers are Eighting back

es and strans placed on a corporation's employees when a computer system is being implemented.

An information system tampers with the nervous system of the argenseators, to prover structure "Deckton explants. "The company is got to involve the uternate users, the employees in the classing process. And headholding is necessary. You can t just plag a system in and wilk weaty."

Or at least not if you don't want honey in your astminats —Jane Bosveid

If rubustel men cooperate d and used their scattillic knowladge to the full, they could now secure the economic weithins of all — Bertrand Pussel

The only certainty in (the) runste future le that /acl cally new things will be heppering

- Freeman Dyson

40 CM

BLOOD STOPPER

In traitware operatingtoom scenos the scriptinexistity calls for the surgeon to bark out; Clamp, plaase nutref in response to a guilting blaod wearel But Curing taal-Mit surgary in today's modern hospitals. Av famel Avisans' is a mose common row

Averse as a white, fully loading powder that stops bleading where other mothmethy as a stopping and typing a sealar with thread, typing a sealar with thread thread and thread thread thread thread thread thread thread powders if a sealar vision of the powders if a sealar vision of the supports and the sealar to be powders if as sealar to be powders if as sealar to be supports and the sealar conditions and the sealar to be supported to the sealar condi-

The powder works by



"Avternel Avternel" is the new pr in modern speciating rooms

mimicking the body's natur

bitode closer, and orken the constants a form of collagar: a user, and offstory well bend set formation. Avanue set and the set of the college of the college of the set of the meeters and set of the meeters and set of the set of the meeters and set of the set of the

Antone has been especlarity height to surgeons who operate on soft pulpy organs such as the low; the heart, or the barn, and an condowascular surgery. which involves grint rg verssels end to end. Sometimes applying a stilch to these or guints is vauly impossible, but a diabh of Antone does the trock

Dri Cher Bor Vech chael et contra purgery at 5 Lakes – Rosenent Hospatal Center, in New Yolk Day and croze a member of a team nest bern a toorn to surgery has been a toorn to surgery it is by normaling a replacement for meto-ulous application of oner-technique. This a lab actin offon when all effective

Also the cost factor has to be considered in Aware use A five gram container selfs for \$130 is cost most hospitals stated in their standard rate for operatingroom time — Darohime Roo.

NUKE SIMULATION

The atomic apprication at Ponnsylvaria's Thrae Mile is land reactor last year has a ready charged the nation's breaks, whole massive amounts of cooling water apprend from the reactor Three Mile Island, how

ever molved a small look from a malfunctioning role?



Three Mile Island's scrubburg pooling towers. The desistor has one ided a sector in concern from measure to small leak apodents.

largest ongoing nuclear safety exponent. Scientiste al the Idatio National Engrisseing Laboratory in Idatio Falls have attered their actious to investigate the kind of accession that ocourned in Pennsylvame

The latitude tests involve an abal planned accidents is a one-suberthiscale reactor loaded with nuclear fail They orable scientists to teem what tesperers under mail-file orable scientists to the accident fails of the place fails or LDFT — when to the accidential loss of vital contenues.

Before These Wie Island the LOFT reactor had two muclear "accordents — in December 1978 and February 1978 They involved a tool tong smoreton langer me valve Technicianis ckdn t spot the leak for 90 minuters

The curr is set body was to generate in 1681 is have at the small-back has was close last November 20 and the spectral of February 4 this year is no overzat to the previous longs back experiments which lasted a minute or so one small-back lost letted 90 minutes and the other about as house.

The small-lesk accidents data it shave any flaves in huclear technology but they confirmed that longer stmments and operators flave apphasecated instrumentalion is being recommended sporpersions can before priment two evolutions. 9 D

CONTINUUM

STAR TAR

Carl Segan nov believes outer space may hold more than pat extratementrie intel ligance. It may also have of

8 N Ktere of Conal Unvariaty and Enc Bandurski and Bartholomew Nigy of there's a lot of stracephere these. It might somediay be leasible and economical to harvest hydrocarbolis from the Journ cases

What's more Sagan and Khare suggest the presence of similar storpounds in intensiolar space. Like the Jo wan polymers, they would



Splice Acaption in one movie. Alway was housing on, more aster space Sagan forcises a future when ships will bring back ocorric crude.

the University of Arzona, have performed a series of earthbound experiments that point to the destence of cosmic crude

In their experimental the loci flock annuals of gases stimilar to Juppler is stimoaphres and mindeabid if with statework flight. The issue Same 50 polymens and hydrocarbon compounds, including offstare butane proprine benasive and butane – contrimon products of tempotragi or indexess were formed.

The compounds would make up only a small fraction of Jupiter's atmosphere lout. be stroky, brown substances the two call theirs, from a Greek word meaning muckly dome

We were tempted by the shrase star car, the teo withit to an acticle in Mature.

Support and Kharte support mansation spectra point to a missive of thome selectrons, and uses between status. If they re competing the methy possible have rough necks could ply the speakways towing their relinence behind them — Jose Daws

Scrence is the topography af ignorance

- Oliver Wondoll Holmas

Tarry great scenato buth goas through three stages Fost, people say is confloits with the Bible. Next, they say it has been discovered before Lastly, they say shoy sharys believed it.

- Louis Agesso

Having only a few visible accentrate if that is the way it works out is not good, but it's better than having no visible scientification - Out Science

LIGHT-SENSITIVE TREES

Of companies and Arab actions are vice the scied benetices in the scied benetices in the scied benetices in the been about to dogs and registionical been to be the science of the order of the science of the sci

Much of the overlighting is altholidal for high-persuice social lights in vogue sance the mich 1980a. They can bathe a theowith 20 footcandies making ingour ingouty and not loss its leaves outrough this triang fred. This courses faith autiont. This courses faith autiont this course faith autime intersection and other trees become more something to an exhibition and other hiszands says H. Marc Cathey a research horticultural for the Agnoutrue Department. Several years of such cycles may kill a tree.

Cathoy terrer president of the Amazena holdou busin terest inter the most association of the Amazena holdow and association that discourse of their termination of their termination this and the amazena holdow and this and their termination of the cases parceptible the media of trees. Cathoy says, methor and their termination register of the association that and the extension that and the association the association the association the association the association the association the the association the association the termination of the association the termination of the association the termination of the association of the termination of termination of the termination of the termination of the termination of termination of the termination of termination of the termination of t

"Man is but a read, the weakest in nature that he is a thinking read."





A suppose wenter to the compy ones. The supervice



The foremost authority on intelligent machines calls for a remote-controlled economy

TELEPRESENCE

BY MARVIN MINSKY

Eaching madeline draw to miss for them server to such thank draw to miss best. As remove of the a server draw the server as heaving server as an end of the server as search groups on convergence and achieves in the endowing server the convergence of the server heaving an endowing the convergence of the heaving and include an and that will allowed the party and include on and that will allowed the party and include on and that will allowed the party and include on and the convergence of the party and the fields of matter convergence.

You don't combinate police fined with services and mutachild with the last method your atm hend, only figure in reproduced at worker place by mobile mechanicel hands Layd don't detrout and simplify their hands have then two energies and simplify their attributions police and weak in though which you as and toll with white country subsets the strength of a grant or the detrout subsets the strength of a grant or the detrout police to be strength of any strength or system to both behavior at the strength of any strength or beginning taken and the strength of a grant or the detrout police the strength of any strength or the detrout police beginning and any detrout the strength of a grant or the detrout police beginning and any detrout the strength of a grant or the detrout police beginning and any detrout the strength of the strength of a grant of the detrout police the strength strength of a grant or the detrout police beginning and any detrout police the strength strength of the strength of the strength of the strength strength of the st

The crude robotic machines of today can do liste of this. By building new kinds of versionle

Minsky inici his 14-jointed, three-eithowed, computer controlled, hydrasille statischet mechanical arm

PHOTOGRAPHS BY DAN MCCOY



The big challenge in telepresence is to achieve that sense of being there.



remote-controlled mechanical francishowever, we implif solve critical problems of energy, health, productivity, and environmental quality, and we would create new industants. Thinght table follo 20 yatars and might cost \$1 bitteri—less than the cost of a single urban tunnel or nucleopower reactor or the development of a new model of automobile

To correcy the idea of these remotecentral foels, somethis of an use line works telespearurs or telefactors i prefer to call them telespearurs or telefactors i prefer to call my futural finant Pat Cantval. Negarearous and have been propriated of the quality sensory leadback and taggest fature on struments that we feel and works or much like our own hands that we won't notice any significant difference.

Telepresence is not science fiction. We could have a nemote conholiced economy by the twentying contany if we start planming right row Thatbochricel scope of such a project would be no greater than that of designing a new mikany arcraft.

new ways to sense the various motions of a

Left Aluminum prosthetic hand created by higosiliv despirer binovic preligives telepresmon. Above Trigge lowches surface of actional skin the serves pressure at 250 ports.

percents hands the means new motions ensores and lightnesh actuations. Pritotypes will be complex, but as designs maker much of this complexity will move from handware to assily cabled computer software. The fait for years of singlengbased single software and the faith of the singlemeans information and control theory and is human interface. During the second docade as will work to make the institu-

ments logicit installo and installo imperior 1 any applied by the nuclear industry is statily to deal with the inseplied with a logic interval installing of disrugge and sharp in particular the lossing and sharp in particular the intervage inspection of the disrupt and platiment to about a syster a sloweling platiment to about a syster and the slower and the slower and solve and a state of the slower and solve and a state of the slower and solve and a slower and slower

The big problem today is that nuclear plants are not designed for bispresince why? The sectionage as all too primitive Furthermore the plants aren't even designed to accommodate the initialization of advanced Integretaria when it blocamas available A vicious protein Perspective sport have sport the sport term sport of the sport term spor

If people had a bit more engineering occupe and their to make these hands meet like human hands, modeled on the physiology of the pain and ingers, we could make hubble-index reactor plants and other hazardual facilities much seler

Wy first vacan dr. a renote occostation decompri cars line Rocka I. A renote. Herrieri hab havid about hystrahina green a disesse cars product must herrieri hab havid about hystrahina green a disesse cars product must obscription hab havid about hystrahina green adolesse cars product must obscription have all about the second preservative and an entropy have the preservative second and have the preservative second and have the preservative second and have the distrahing have, some mean motion for bitselay. Weld cars makes must be distrahing have and have the distrahing have and have the distrahing formation on faith have a varisessed and have the distrahing have and and distrahing have and have and and the weld have been have and have and and the weld have been have and have and and have and all have a line in barries of the source and the second have been have and and the second have been have and have and and the second have been have and have and and the second have been have and have and and the second have been have and have and and the second have been have and have and and the second have and have and have and and the second have and have and have and and the second have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and have and and have and have and have and have and and have and have and have and have and and have and have and ha

Developing telepresences will involve hard scientific and engineering problems, but I believe we should go sitesial. Present devices are so clumey they are used only when nothing else works. Once improved, however telepreserve will herei i in

 Safe and efficient nuclear power generaton, waste processing, and land and sea mixing. Last year s Gut of Maxico underses of blowoul is the kind of accident that I'm convenced telepresence technology could have helped to mitigate

 Advances in fubrication, assembly, init speciality, and maintainane systems. With telepreterizes one can us easy work from a floasaint effek ways all from the float Manual lator could aday to dona without leaving your home. Poople could form works the count float and the units where A floatern floaters and the set where A floatern floaters and the could mainta has or her abilities in Japan or Arteraction.

 The edimination of many obernical and physical health hazards and cataban of manimudual and support between the ministruct teleposerse for use in metosuspery for example, surgening catal higher angres (and the surgers) and the second of the surgers (and the second of the second beam. Other organs beyond the result of society and thereps cauld aimiliarly be reoriered or substantial

 A reduction of transportation could and in emapy and community frame emailshing one parson to do different juics an different places. Mass transportation could be replaced by ubspatious thain emittally contended by these particular transmission of wices could lik severes recorded conducts, and water mains from within "Subcontation will do away with all hazandous and unplocated toxis.

 The constructors and generation of level costs space statution. Telepresence mpth prove invaluable for solar power cashing costsulation—for amissing materials in space and supplies for the human were predicted as the second for example in a served second second second for example in a served second second second for the second second second second second second second second for the second second second second second second for the second second second second second second second for the second second second second second second second for the second second second second second second second for the second second second second second second second second for the second second second second second second second second for the second for the second for the second second sec

Remote-controlled mining can exploit bonder isouacies effecter() and hermonely No one is exposed to the dangers of exolosants or of breaking in call data. No more blacklung classes We will mine the motion this deposition diministic examines logistic grunnel combusions and gastification softeners, which are presently infeatible softeners, which are presently infeatible ministic levels.

The toggest chailenge to developing lidepresence is achieving that sense of "being there." Can telepresence be a fair substitute for the seal thing? Will we be able to coopte our anthold develop the network way to construct the sense of the sense in the sense any necharismit of human orderings?

When any pib bacomes too large small beeng or light for human hands. (Becomes difficult to disrigurant the number list and alias tody of the restorment from what it's working on "hispiteence will be able to adjust and comparises for such problems, those making the job easier. For instance, a semote "miner could dig a namow seam without himself having to stoop or crawl Machines will incorporate new hennes of human sensory pattern perception and leadback control to "reflect" accustoly to the user the modified increate sensations

We have taked of mercy but no notice too much coal winne, we are like to not becoming dependent on nuches too the found twent to be taken the third thinked Based of the taken but the taken but of the taken to the taken but all nectors have the potential to taken but taken but all nectors have the potential to taken but all nectors have been but all to taken but all nectors have been but all to taken but all nectors have been but all to taken but all nectors have been but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all nectors all the source of the taken but all the taken but all the source of the taken but all the taken but all the source of taken but all the taken but all the taken but all the source of taken but all the taken but all the taken but all the source of taken but all the taken but all the taken but all the source of taken but all the taken but all the taken but all the source of taken but all the taken but all the taken but all the source of taken but all the taken but all the taken but all the source of taken but all the taken but all the taken bu

These problems compal designers to choose between two extremes One is to build each part with monumental toughness - to minimize human exposure - and

> A lunar telepresence whick could have surveyed a substantial portion of the moon's surface in the ten years since we landed there

hope this system rever fails, this is today s dosigners favoria approach. But in the end boakdown and failure coour anywey inguing matrix intervention. Even a minimalitature shuts down a reactor for months.

I mink the better estreme is so build intoit, ular systems that permit percetic inspection, maintenance, and repair. Telepreserice would prevent crises before they could also.

If no reverse in the buildings in one week to resolute the resolute to resolute memory about Toterables would be exposed to resolute the resolute exposed and thereboth does it induiting afters or lawset the resolute except by way of takes and thereboth except by way of takes and thereboth except by the resolution of the resolution except the resolution except by the resolution except the resoluti

We can employ telepresence in any environment alian to humans. Most of the earth, for example, is ocean. 'moorwalka' on the ocean toor at two miles' depth as technically more difficult to execute their moorwalks on the moor or Mars. Remotely: operating satisfies "continuistion tower could bygess they prohibitive basets of weather-isocialed shop and itserferose bavers in merging on the contended attell The U.S. Office of Nava Research has been another configied deep set exploretion projects, and exclusive scale protolaum and minoritals. Exercisely only will applies from dividual days and minoritals. Exercised with a surface

There are already some undersea maripulators. The Akin submetriable at Woode Hole, Massachuseth is wonderful, but to men pulstor is used marily for promig up amples for pooled hand with for a life to see one that can do anything frighes can do

In pages the emicrop success of Wange 2 and 2 shows how much can be done with emicise costrol—even with displong transmission denies. The twicing species with had patients the initiature. There wild no will be inconfigure the equipment to miss used of whith was been required a week of benafiliaries pleaning was required just to get Wang 2 for turn a spone over

If this like best way to applow the planats is to have people in obtaining spacecraft to openate telepreconces that manevare on the guidance manupulation can make entorsive occentions, then reconfigure assimtrite equipment to exploit what has been discovered.

This have much more we could have somed with a permanent website on the more. The Earth-Moon apage of-light days is short except for slow but peduction website installing glub traverses of one kilometer per day we could have surveyed assignment asserting issues taken the tempode bare.

Arrong the most execting prospecial for solving our enroy weets is to build a mig of solving power askilles in rotat around tam't Safe, texe olds renegy coald this bla citlocated near our other. The main with bla citoted near our other. The main problem is the cut Win must put sufficiently large subulates in space to gather enrough surlights arrive each station requires to and then there is the cost of sending benefic minimum to build them.

Telepenance could save billions of dolars by employing remote-controlled hands attracted in octati and controlled by techniciase on Earth and on the moon. Most satellife construction could be done by proplevorking at their dwit homes afted dotted.

To circumvert the cost of itting satulates payloads against Earth's povertial gravity scientists have been deviaing why to manufacture and surrich materials devicity from the moor of thom the associal, Building such tarse facilities, however would be impossibly expensive if camed out entities by mpin in gase a sist on the moon isstead why not use cheep Earth based later we telepresence to build moon tooloess? Imagine having too po to further than your soudy to openate a charte on Mare letbrum. We need only sand telepresence machines on innecenses one we too.

The scenario includes averling 20 mer men and women to the moon. If is not very difficult Saturn 5s have the potertal to simplify a low of barentists and regiments with mery months supplies (0 ob) they up a nature where a low of the state of the there we need you have baren the suppliers and instity the superfields to ideoreous and instity the superfields to ideoreous their institutions. The population is in the supervised the work and dyful the suppresention meansate.

One major colduate to all the has been MARAs expensions antity to ose with such MARAs expensions antity to ose with such the U.S. goals program is antitier in the U.S. goals program is antitier in the U.S. and the Maras Resource terms as constant of Amer Resource antiholy in real Amera Resource and the Amera Resource and and the alternation and the such and and the alternation and and the and and the alternation and the and the such as the antibiotic and the such as the such as the antibiotic and the such as the such as the antibiotic and the such as the such as the antibiotic and the such as the such as the antibiotic and and the such as the antibiotic and and the such as the antibiotic antibiotic and and and and and the such as the antibiotic a

This space shuffle for here as an emit tip reventing and uploan But here we have an emity issues to have a strength of the second but weeks any shuffle to an exist a state weeks any shuffle to an exist and a state back and a strength of the second second second back and the second second second second Alaxies that manufacture for the second second and the second second second secon

While the stratidist irms are moving (pached) contraction criminal. They are the beggmaps of garr (desperators, At the other maps of garr (desperators, At the other ong) used movemeng-balance, two (see spectrators Buil none of them have any samders of a stratighty, was could develop encode for autoparty, was could develop encode for autoparty, and could develop encode for autoparty, and the stration product hard analytic and the stration strategies and the strategies for the product hard analytic includes product and analytic includes product and analytic includes the product includes and the strategies and product includes and product includ

The field crude sende-controlled me channes hands were built assured 1947 at Argonie National Laboratorias in Teore, for handling dangerour chemicals in 1964 the late Har Goartz, a scientist et Arctinis



2.0

developed hands in which electric metra: the line state of the line state state shat is not the operator could not constitute on the state state of the line state state shat is any state in the langement state is any state why the langement state states

Early penalers like Genra had the tentagy of building before robust al various kinds, and thirt peoplegic interested in my laid, antificial intelligence—geting robots to do smart things. And we did get them to do simple machanical things, some factory work, like assembling a more. But they were always hand capped by those temble claw hands.

To create how biochemics, we must apply more mixed average yetworks, must leave which accessly advected as more loar-able in 15 bioling Manhar an wetpend a streptoperator, called Hinther yetworks and a streptoperator. Called Hinther advected a streptoperator, called Hinther advected any called strept advected any called Hinther could will handwork any called Hinther could will handwork any called Hinther advected any particular advected any called strept advected any called the strept advected any called the strept advected the stre

Another big mempulator was designed and built in the late Filoss as part of a project to baild michair amplanes. But Congress linelly decided the plane designed to say effold for a year without landing vesified be sale.

Affragh bascally life work has been done since the Plass, thermowershal live move venable experimental manipulators Executedentical Laboratory in Dispo has made a three insperci 12 privide hand in a can rate hashin But that about all it can do A group at Stanford University invested a long, anisiefale retractive but a Nyende down and an that can easily test accound a miner can easily test accound a miner can easily test accound in miner can easily test accound hings in the way fail no prove his accound hings in the way fail no prove his the neovemb to partled any such his to

I think we should make telepresences that compare well with the human hand a five inguised device capacities of initiating natural manage theories to be made. We might then adapt designs and ochoopte from the om to make logs, paiding a system able to work wherever people can not only on paintable present them.

To control such an instrument, we will re__OMu

want a light well-introlling a serve that includes effectors to reflect the sensations. This will require advanced in moments and new muscle employing devices, for visual loadback well need sensitive the operatics head-and ease motions. We probably would want to have an eye of some sort on the ingos

A Philos enginear named Steve Moulion made a nice telepresence eye. He mouted a Vice telepresence eye he moutbeimet so that when he moved he head, he comers eye on log of the building moved, and so did a wavering screen tetached to the helmet.

Weening his behind, you have the feeling of being on top of the building and hoding account Printaciophis. If you i foon over, it's lond of creepy that the most pensional thing Meation do wait to gut a back-over initia on the neck so that when you turn your heard 30 degrees the mounted wetamis 80 degrees you leaf as if you had a nubber

> With telepresence you can as easily work from a thousand miles away as from a few feet. Manual labor could be done without ever leaving home.?

neck, as if you could turn your "head, com pletely around!

Why do lettermine the elevering 20 why do lettermine the elevering 20 who do not be the second second to the termine the elevering interface to the termine the elevering interface proting the elevering interface promercoempaties interface between the elevering intermine control control control interface to the microcompaties interface between the elevering interting the elevering interface between the elevering intermine control control control interface interface interface interface between the elevering interface between the microcompaties interface between the elevering intermine control control control interface interface interface interface between the elevering interface interface interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering interface between the elevering interface interface between the elevering int

A good production engineer can solve almost any specific problem by using a special pg (abricating in rewpart, diveloping a special tool for the hand, or replacing the band with a special tool. Each problem gets solved, to be sure but the overall lechnology becomes announced and goes unnology becomes announced the one at Three Mile failand or the Mexican of split occurs and we find out thronis no way at all to turn a when from dive, or to seelage it in turn and we find out thronis no way at all to turn a when from dive. In the seelage it is the non-set of the second second

Several mage companies have board inorder in selectroperiod momental multirespondent in the several momental multiand chrant-though noise of them insue reschad chranica miss. Many similar html pomeses may prescue ait& - Usipomeron and resonance and others the Defense Avancent Research Projects Against working with loaring of ta against press in freetens: Standard Courter of the only and the several several courter of the only and the several several multientity present and courter of the only and the several courter of the only and the several several courter of the only and the several several several moment projects at Campa MT all unreshift tables.

¹¹Per d be noted to be been that leading presents has never been appoint of the been appointed of the

I would be difficult to assertive such as optimizers in solver a pandemine arroganes. While we need as motion flags, but the second and arguments resources that load Comtand arguments resources that load Comtand second second second second second table second second second second second table second second second second second table second second second second table second s

Light Imagine anyona doubting Initial or opinations is possible. It is a matter of obiing many posteries that are shown that and the initial of the machine and all the same through these both theorem encount states at through the both theorem encount states at through the both theorem encount states at the same at the same at the same think the weat should go round and count states are separatly on a robot that is using a serverther. That all right for the observation but the end matter port in this for a separation to exclude the same and the same and while at torong to be the same and the same and while at torong to be the same and the same and the same at the same same at the same and the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the same at the same at the same at the same same at the sa

Some research has been done in the psychology of spatial perception in terms of sectlack controls and the internet should be the sector of the sector of the sector sector and the furniture network of the sector sector example that can transiste part into "test". developed by JC Bits and JC Linefiliat Startord which coulds the bird to readconventional private materials a guidgethat this conveniently on your incepting and hist his a lot of mission work in the globe of the first to later with versions that allow of the first to later with some it laboratory persistent subject to being Mills overly basmentation subject. To being Mills overly basmentation subject to being Mills overly basmentation and transmit anality base auriliane from the second second second second second "Not" and transmit anality bases auriliane from the second second

Someone acuted develops entries devices for teleprosecole - wholeng patterns for example that would convey the screazones of hot or cold However, very title is from about locals screazons. It seette quite incrisit to me that we already have a device that can translate part into feel bot that we from nothing that can translate faul into feel.

Everyally adoption on will improve and save do plote and credue now create Later 35 well kears from about robotics many to have been been about robotics and become "supervisions" in the long run whose each stage loward selection aerises and output downed mouth and plotted and become in the loward indexed and the loward indexed and plotted and become and the loward selection and output downed robotics and become plotted and and and and and and comments interesting and beam mous about antices intelligence.

Computers equipped with artificial fands and eventsate actually grasped and moved objects in accord with vertial pommands A complicated process basing was post operating (MT 3) in othe pumpwas put logarities at Standord, a toy autothroade, was constructed in Einstruch Scottanel Smith work has been dara at promise streadow. These becaracy pocomma streadow. These becaracy potree becaries, although we can do many or the becaries, although we can do a many any put more threadow. All all work for to do many timing any characteristic to do many timing any characteristic to both a streng way off well in work to both a streng way off well in work to both a streng way off well in work also the potential also the potential

Bill interactions that the second sec

If each stop toward telepresence were also a step toward the economic pain and psychic graff of unamployment, one might contacter working against 4. Not a generation of reforme is elevady of making many of the unable solar that is elevaneous orabit



preterver. Tolophosonce offers a free market of men's and women's skela, rendening soch worker less vutnersble to the models and fortunes of one emotiver.

Timular in a strange const. The quotions of internatiogues usergiogrametric may bascore moto. Many-young people today sensitive it derenating to be build to any stratige engineering out as strateal loss that the sensitive out and the literation of the sensitive out and the literation of the sensitive out and the sensitive out and sensitive out and werk about changing the quarky of it dependent sensitive out and sensitive out and werk about changing the quarky of it dependent sensitive out and sensitive out and pendent sensitive out and sensitive out and the sensitive out and sensitive out and pendent sensitive out and sensitive out and pendent sensitive out and sensitive out and pendent sensitive out and sensitive out and sensitive out and sensitive out and sensitive sensitive monotonic out and sensitive ou

Postscript from the London Jelegraph Foreign Service

Pages - The Freich government has authorized Electrical de finance. The Freich Constant and State and State and State State and State State and State and State State and State State State and State State and State State State and State St

The orderand of the crucks first was declosed by nuclear anguiness was bounded unit that mere the resoluting particle tables of superprint models equiphrent Extraols (Kalasula-Monute), potentimes the declosed particle and excernly countime (Fast the declose was extratacted of the declosed and excernly countime) fast the declose was extratacted and the declosed and excernly countime (Fast the declosed and excernly countime) fast the declosed and excernly countime (Fast the declosed and excernly countime) fast the declosed and excernly bound and particles and the second and particles and particles

Since Prance Is walking the tightrope of positive power anonyges and Electricate do France has alwared they beauting your cuttosclor may be measured in the concrete and the second market the concrete minimal her deviation fraction caucion methode by opaming the reactor caucio now a greater than the danger of secious moders tier.

My work in artificial mailgence is carried on in a workd as much factori as science. This essay used specific suggestions from loaar Aarroy and Robert A. Henleri as well as from Carl Sagan. Brain O Lessy Edward Purcel: and many others.

For most individual in recommend, Remotely Manuel Systems a default by having them (Calleon 1973) and Human Pattern Agabasens in Telepoperator Detage and Operations in the Galocasian of R Control (Wing 1971) For a discussion of the Control (Wing 1971) For a horizon and of the second of the A recented Contary Wine added by M A recented Londary Wine added by M Things had changed especially the war between the sexes



Di sonnactione productore una producto per sono de la di producto per sono de la di productore de la consecuencia de la consecuencia de la disecuencia de la disercición de la consecuencia de la diproductore de la disercición de la consecuencia de la diproductore de la disercición de la disercición de la dicatación de la disercición de la didiación de la disercición de la disercici

DEINTING BY

gide--- I had noticed that this was how most of the women here on Earth were made up with both hands and stad, "How goes if col?" Then she sat clown

"It's boring here, don't you think?" she continued after a moment. "Shall we take

'I'm not a col,' I said. She leaned on the table with her allows and moved her hand the golden chain around her fingers doped into the liquid. She leaned still closer I could smell her breath. If she was drunk it was not from alcohol

'How's the?' she said. You are 'You have to be Everybody is What do you say?

If only I knew what this mean

"All noht" I said

She took me by the arm and led me toward a dark-cold wall to a mark on it alltie wall opened. I felt a gust of hot air

A narrow silver escalator flowed down come up to my shoulder She had a catike head, black hair with a blue sheen, a profile pretty if it were not for those scarlet nostrils She held on to me tichtly with her thin hand the oteen nais digging and my heavy sweater We want out, passing a number of half-empty bars and shop withperforming the same scene over and over again, and I would have liked to stop and

"Where shall we go?" the gut asked She sillheid on by the arm. She slackened her pace A red stripe reflected from a nearby shop, passed across her tace

gleeder It's nearbu

We came upon a moving walkway we stood on it, a strange pair, lights swem by now and then a vehicle shot along as it cash from a single block of black metal, they had they careered as if blindly and at tremendous speed. The carl suddenly stapped off another that clarted steeply upward, and I lound mysell suddenly high up, this denal nde lasted perhaps half a minute and ended on a ledge full of weakly fragrant forests. It was as it we had reached the conveyor belt set against the wall

The girl entered this loggia, and from it, surrounding buildings, windowless, black

reached me. apart from the sharp has that amounced the passage in the salest of

whisper I say only the pale smudge of her opened, but not into an apartment, and the foor moved softly together with us

We were in something like a huge eneard by streaks of jumpous part in the darkest place the girl again put the pain of her hand flat against a metal piete on a door and entered first. I blinked The half brightly lit, was almost empty. She walked

The furniture looked as if it had been cash in class arrichans a low sofa small tebles inside the settionsporent material arres they discersed then they would join analo and sharens and a seemed that a

She did not even come up to my shoulder She had a catlike heard black hair profile perhaps too sharp, but she was pretty. If it weren't for those sceniet nostrils ?

luminous blood coursed in the furniture cale order, commoded with ank source

She was standing tar back. An armohair untrikited and to more me I haved that The "glass" was not glass at al-the mpression I had was of sitting on inflated cushons and looking down, I could see the foor indialingly through the curved thek surface of the seat

I made musel comjortable in the chair men really did look like a sculpture in azure metal--- studied me carefully She to jongs seemed that way to me before What's your name?" she solved

"Brigg Hal Brigg And yours?"

Nas, she answered then asked, "How

Forty What about 17?

"Nothing I thought you were a hundred "

"I can be that if you make" The fundsting is, it's the toth, I thought

"What can I grue you?" she asked

She went to the wall, which opened like a When she returned, she was carrying a tray with cups and two bottles. Sourcano one bottle lightly she filled me a cup to the brim The local disolved exactly like milk.

"Thank you" I said, "not for me

"But I'm not giving you anything ' she said, seemingly surprised

Seeno I had made a mistake, although I did not know what kind of mistake. I mut-She poured herself a drink from the second sightly etterwescent under the surface, at the same time it darkened, apparently on contact with an She set clown and touching the glass with her lips, casually asked, Who are you?

"Accil Lanswered Littedmy.oup as fit exercise of This milk had commol. Label cold

was sending in the clark, eh? Since when? that was only a cals I was with a six you see but if only a case in the arrive way no good and allogether I was just going when you sat Cowf

Some of this I could four put I must have sat at her table by accident when sho was not there, could she have been danc-

From a distance, you seemed so She was unable to find the proper word

"Decent?" I suggested Her evelids flutas well? No. It must have been everyhadow

"What does that mean?" Well um someone you could true Isan

You talk in a strange way. Where are you

From tar away"

Iddfy

And now?

"Nothing Liteturned"

The conversation had trailed off some giming to regret her rash invitation and

"Marbe I pupt to go now?" I ventual

"Why? She was genuinely surprised

"I flought that that would BUE YOU "No," she said "You're thinking-no what for Why don't you drink?

such proumstances! My auronae was such that she must have noticed in

What is it had?

"Its mik-I said I must have looked

"What? What mik? That a brill

Descripted from Passes from the Stern by Barress additional in the United States for International Texas and an the United States for International States and the United States and States and From Passes and States and States and From Passes and States and States and From Passes and States and States and From

'Listen, Nass. I think Fil go now Really #

cide's understand a time, Not a thing, M

"Al oght," she baid finally "Tim not keepwhat I called the sparking liquid in my

Tel me about yourself I suggested.

Imat the Cavuta in my second year five plasting regularly and that's how it's

was shill holding the cup I took another

curing revealed distering seeth in her she riched it of? Was that supposed to

quence 1 am I was a plot The test sme I was here Don't be techtened

it was a hundred and twenty-seven I was a priot on the expedition to

owny. We live there and back in a hunsturred. The Provednus, my ship in

She stared at the She did not speak. Her

Why do you say nother o? I asked

'So how old are you, teelly?

What does that mean-really? Bolco cally instrony but by Earth clocks, one

A king stence then sudderly "Wos

Wat I said "Do you have anything to

Strong Alcohol or don't they drink it

Very rarely she replied solly as riths in

No 1 don t' I related with unexpected stubbonness. Ehe went to the bar and

> So that s what a cigarette looks like No wait-the other thing is more important Rol ro not milk 1 but -- to a stranger -one always gives bril 9

Don't be anone I said amotive the

Tm rick angry You cide? arewer but

Why not? I can tel you There were

Tecause of children," Leoplaned "You even twou could no one-would want to You part by before you re theity You have to other words, women of theirs usually have

And you?" the asked

You wanted to Wes Of course

"It must be wend opping back like this "she said simpst in a whisper She shuddened Suddenly she looked at me

Listen what I said before, thet was just a

About the hundred years? I asked

Stop 1 grunbled "Any more applicable

makey from two

What will you do?" she asked quette

No I have a little-it's a bonus you understand For all that trop. When we left

a sort of school, plasting, nothing great in

Then what exactly do you do?"

How can l explan? One makes dresses.

What does that mean?"

Well yes in a sense, yes I don't design I only make

Dawn up

And what is a real? I asked

people there A real is insticual but one cantitel the difference. Unless | SUCDOSE

Got nº Laten Nass I and I ather I Loo

But you don't know what I want to say

All moht I sented to ask you more about

"Doe can do a pie of Panos." she answand "One can travel potually or by most. One can have fun, go to the real

What is a moot?

It a little like the Init except you can tans there, on anything-you'll see for wanted to ask about something else

"four impression is not? How is ifbetween men and women?

"I suppose the way it has always been What can have changed?

"Everything When I left-don I take this have brought me to her place at this hour

Because it would have meant only one

She was silent for a second And how do you know it didn t?"

My expression amused her I looked at

"Nais how is it "I starrithmed "Nou take a complete stranger and

"Why don't you areseer?"

don't know how to tell you. It's nothing, you

The its nothing," I repeated Are them stil marrages?

1 don't understand. Explain this to me sethout knowing him right away

"But what is there to to I?" she said reluc rantiv Was it really from in your day back. (000ff-2

She pould of course, and even with that purpose but not five minutes after see

I looked at her She was gute serious Well, yes, how was she to know? I



she had to see something in term out to together

Whit ' she next 'it seems that you

"What bet? At, the milk? What of t?

She becan to leach: she was convulsed

So you thought you thought that

A cigarette. What-you don't smake?"

"It is the trait time I ever sow one So stranger - one always gives bot.

"Not

"What chansed do?"

"What it does as that he behaves that he



"What if he doesn't want to drink?"

"How could be not want to?"

But you pant force him to dank I con-"A maximan might mightsk " afte said

"Aha Well in a sense yes But you can

people in my day called nuclists

"I know No. that's something else I

piothes? Just as necessary?

This When there are hap of you

This conversion was ideals, and I tell terrible, but I had to find out

"Later? It varies To softs you abaity

The resected putor, I biurted out "What does that mean?

"No nothing And if a girl visits a man

Well, he ran out Or the could always

She began to laugh "But thets ... You thank that I keep bottles here in my apart-

Where they come from, I don't know in your day was there too water

"Those was," I said glumly These could There, you see! Did you know in which

"lunderstand Noneedtogoon Allnoht So is it a lend of salaty measure? Very

You re in such a hurry You still don t un-

Toldn taky anything wrong Tolefended myself "Tonix wanted to know ... Why are you incident at me like Itel? What a the mat-

She out up slowly She stood behind the

"How long ago-did you say? A hundred

A hundred and beanty-seven What

"And were you betrizated"

No you werent, she wisspered if

siting new You see. I'm sitting. Calm your-

They out something into the blood. I

doesn't work

little mad This bit Well it's like handcuffing everyone because someone moht

You reterritio "She seemed calmer but indignant before about my bringing

T don't see the difference. You re sure

But maybe now? When you seturned?

You lear Did you think I would attack

tion you see ion t done by bint. With the brit-Ts only-a side effect. Beblization has to do with something else She was pale

I can't I'm terribly afraid "

"I swear that

No no I believe you only

in order that it be

When I said that

"Nothing But then it's only a thought

"But you can? Prohi? You really can? No

moment I added "But it would have been

Yes but not completely. Maybe a little

you weren't She broke off

RAMBUIE OVER ICE WITH THE SUNDAY PUTZTLE


Feeling lost in the crowd? Cheer up/ Science has found new ways to show just how special you are

THE UNIQUE YOU

BY RICHARD HUTTON AND ZSOLT HARSANYI

We use storing the Jop of Joppmenty As we shought to terrain interbeats, or or organize story insusating staffest in a third terrain and interbeats, or organize story insusating staffest in a third terrain state interbeats, organized is a staff within an interbeat state of the story insusation interbeat interbeat interbeat states that now ways to satisfie the indexident many operation states that now ways to satisfie the indexident many operation states that now ways to satisfie the indexident many operating present access of the base states in their possible access to booling that specifies access the tax states in their possible access to booling that specifies access the tax states in their possible access to booling that specifies access the base states in the possible access to booling that specifies access the base states in the possible accessible that the specifies that specifies access the base states and the specifies and the specifies that the specifies access the base states access the specifies that the specifies access the specifies that the specifies that the specifies access the specifies that the specifies the specifies access the base states that the specifies access the specifies that the specifies access the specifies that the specifies the specifies access the base states that the specifies that the specifies that the specifies access the specifies that the



PAINTING BY DON IVAN PUNCHATZ

claim to uniqueness. Their dentities derive from their ability to own something handmade, homemade, self-made – somebing, in short, that no one-lette has,

The situation may seem polly ont, but our solvation has seem polly ont, but fact, been here all along Nature has wooly endowed eech of iss with uingue charactionics thatinc even the persisticatial age can steel. And scence is geting ever betler at massure and horitablean them.

The lare Thisoconus Dobuhansky of Rockelete Unexcess hold the staggeing number of possibilities that event in the forman gene pool. If all the imaginable characteristica are added up he said the number of potentially possible gene constellations times out to be guarder than the number of subations particles estimated by physicialits to easil in the universe.

So while society publies us lowerd conformity nature keeps pulling for variation and change. And while remarked institutoring pensist in styring to transform us into social clones, our internet lowers on a sale that we remain unique and uncopable, as ingenial, exceptional, and singular as failes of sow

Decreme of characteristics contribute to the unspervise that clashinguates as them one another Possible demines range from these envises and hand shapes to electical envises and hand shapes to electical vessible nucl type. Characteristics have these are nucleous to the state of the hese are nucleous the state of the state

Our bodies are composed of many matenate, and primary among them are proterns, the structural and functional building blocks of cells. Proteins come in all shapes and familia, and most proteins, deploy in rance of clearly chocentrolia variations.

Decayse many tables, stops and rely goals communications around the world lend to toolate their gene positivity world lend prefers instances can trave be used to inderify minimalities that is a blend in the shared proportions that is a blend in the shared proportions that is a blend in the shared proportion going by the down of the proportion of the shared blend and proportion of the shared blend out of the shared blend blend out of the shared blend blend shared between the only of and Alasien Element of the downeen of and 64 peopreption

This ringht seen important only if a beattale, mith, Asako looking man wentbaud wandering filtrough the streets of Junese, Alaska, but amthropologiate have used freee and other backgoar markers to taoo migration. Isteeding, and worknowny patterrise in furning populations. In addicatio, protein typing fess beer used to determine patient byping fess beer used to determine patient byping fess beer used to determine

Because every person is a unique stand footing in a sex of microceganeous, gettin types ont alloc be used to tell us apart from bith we are surrounded by bacteria lung, and verses of all kinds. A few are set, one paralistic or exploitative and cause deease but most consider us their homes and Greed happily and harmlessly in coones throughout our bodies

Deferred positioner of microorgenetism pledstättlebet neurosa partito da human bady. Becaune our body nutarear and ecretores, un glandika registater a data deferred da human bady baser and state up residence when The semantale constrancy in the way certain microorgatemen are detinicable on the body of each of water bady and bady of the form the development of a science of shores of the development of a science of shores of the development of a science of sciences.

Since microsopienerre are living creeburs, each packes has individual virtuals, within il. Though most people might their that a Corynsbectworm second living other other name is oil a xecoid, each germ has its own recognizable characcenters. So we can be identified not only by the dietibatan beither of the by the field dietiba-

Society's pressure pushes us toward conformity, but our internal blueprints ensure that we remain unique and uncapuable, as original, exceptional, and singular as flakes of snow ?

tion of our germ populations but also by the individual microorganisms themselves

YOUR COORGUS IDENTITY

The correct micrograms activity of their architer way to dealing use-armal petits. An individual not only carries an intertiable door tou leaves a trait of the hind him- a list that wavy dog a near work. We differ from one archite actors an entire spectrum of ockni test carries an entire spectrum of ockni test states and the spectrum of the spectrum of test at a tog carries of the spectrum of she at a tog carries of the spectrum or petities at matching to be led.

People entri both peneul and spocito dors Worter, for example entri volalle subsiturces that vary with their motify mentitual cycles. Dhe investigator decouered that the gave German shephasid the peneul scient of progestration (a leanual tradition), that there have a sport of the worter or by worter in the latest stages of their mentitual cycle. Other spocific odass with make us tatistate or republicable to maquitoes are now being identified so that effective repellents can be manufactured

An individuality street can be defined approximately the mean of the context, assipantial dreem leaves and of the context, assituppertropose there are chronological to the basis in part The allocity areas in one of the least of there is a basis of the context of the street means there is a street of the context of the least of the there is a street of the street vision means there is a street of the street of the least of the street of the street of the street means there is a street of the street round reported the case of the risk for a street round period that a disactive vision were so leave of the street of the street of the street of the original that and street of the street of the

Such observations have also scenaris to therize this human implifies were communicate autobiotecolarity or means or and worker observations. More all most are involve the analysis of the there are involve to an analysis of the thermal entropy of the analysis of the thermal entropy of the analysis of the thermal entropy of the analysis of the thermal entropy and the analysis of the thermal mounty and by occurs pushees with the outer that out determine the analysis and depotenties.

Matchnes under development folgi use geschrunsbigszehrun anglize and record the palaritis of arborne organic visions, chemisals in concentations below one part get tilter – far boyen dur over ability to detect doors. Though the technique is to direct doors. Though the technique till in the regenerated stage it seems likely that we will scon be side to item?

BLOOD BONDS

An old saying holds that a person's characteris written in his blood. Scientists are finding that, in a sense, this is true Blood wates from person to person.

When meet propie refer to "blood type. They are thread propie refer to "blood type. They are thread propies and a second propies or A, S, AB, and O. Hematologiste, however, type peoples blood into much final cutegolias. The A-B-O and Rh systems, for example, an but two of more then two dozen blood orough that offer among us.

Knowledge of blood types to important, for sale blood barafusions, for preventing hemapito disease in the newborn, and for teamplantiston subgery. It has also been used to clear up conflicting clears in crease, of doubtil peternity kingeping, inhealance, and the institutent switching of interes in thereafts.

Dhe of the most useful applications of blood typing in anilyzing ingroduction and childbirth. Coopie a with incompabile blood types doubles indicate have a higher incidence of childrestreas, and women of one blood type can produce an bloode against incompabile sperm cells commang owneas in



This new marriage between satellite and computer promises a garden of earthly delights

EARTH SCANS

BY CHARLES SHEFFIELD















Sanura incet to wride whose matu coases sensinged sand curres (JANDSVP, sithly to (Sangar) family is to saturnal sprindar of the Shearannal sprindar of the Shearannal sprindar of the Shearaned Willy name Which West Virgna (for jet) Tho photoseprensity moressite mage of the Namo Desert in Softwest Almos The Initia one sprindar for any sector spectral discrimination of the Shearan spectral discrimination of the Shearan discrimination of the Shearan discrimination of the Shearan discrimination of the Shearan programs through the Systems programs through the Shearan to virial information of the Shearan to virial information of the Shearan present to begin with the shearan the virial information of the Shearan the virial information of the Shearan



ELECTRONIC TUTORS

Education is about to undergo a revolution unequaled since Gutenberg's movable type

BY ARTHUR C CLARKE

whet and not increasing one of the opy for more than a centrary for date index in the attrain haby of lacknet, opy for more than a centrary for date index with executivity of argments, scatterists and anyone disk index with executivity of accused in the solar index and anyone disk whether anyone catalog makes the solar index and anyone disk whether anyone of anyone date that anyone date whether anyone any

There has even have a subjections in advance, in a direct a time. Simply no comparison can be made belowed into two dores. The pocket calculator is maken or linear more accurate and accurate of times, awater that the sub-rails, and the machine calculator and the same of a sub-rail of proper downed them balance can be not accurate and the same into a site work where changes the wonder the older in manufacturant time grows and in barranse. Types have a good balance, issue if it your well it will some day a valuable accurate the same accurate the same of its your will it will some day a valuable accurate.

Pocket calculations are already having a protound effect on the teaching of mathematics, even at the lowal of elementary althematic. But they are alsout to be successfeed by devoce of much greater power and sophistication --mathematisma change the very nature of the educational system.

The grant development in our near thrue is the portable electronic (reary - all issuiny randing) of blocks, but of fings and music, the life electronic the story of an average block and we protubly open in the same way. One will not be the acteent with high-definition, (id-actor display). We other will be a keybcard; much like one of tody's computer consider, with the life light-block of light, bases mathematications, and a liange number.

PAINTING BY MURRAY TINKELMANN

of special keys - perhaps 100 keys in all it wont t be as small as some of today's midget calculators, which have to be open alled with toothpecks.

In Thesi's such a device could have encould memory to dail the books in the encould memory to dail the books in the more models. The the technologies and place table. Whose additional lifectine could be institute in the pothelie library when necessary. All this technology have used variants devices the technologies of technologies the matter the designato them on the new rate the designato

Practing material may be capelyed as a load page or tele scription's or her in takupaned at a combrasile reading rate. The balan scaral appear ain an ordening tool. bala they may weaturally be displayed as there-dimensional holographic mapse. Nat and migrary of cound Tabley's tips ascompanied by scalar Tabley's tips ascompanies of the displayed as on a cotastate. The description kerver years benefits of galaxying the scores on ised tools of the displaying the scores on ised tools.

And how not to be able to summon up Lond Clarks: Colveration or Jusch Bitconvskis Accard of Man whenever or whenever you felt kike int (Nex Harchese tapes cultimity cost about #2/00 aproce, unless you are Lacky or wickout enough to have a protect copy But non day the BBC will go himmony back and threewise the proce will be prentixe.)

all skill how to be a solution of the set of present of the set model (the operating to care one of the set model) in a large classes descation, expendity in large classes descation, expendity in large classes descation, expendity in a solution for class up points the does not understand the set of the set of the platform was the true fragment on the platform was the true fragment on the platform descated to the platform.

The electronic train will go a long way broads along this problem Some computer program aleady allow the stratem, along it qualitations and antwenting the upsetfore it acids. Computer adds the along on-CAL not to be consided with along on the computer program and no with aciditic busines period.

Technology a influence on education is rothing new. There's is not of eaving test the best obscattonal setup consists of a log with teacher all one end and pupil all the other. Car modern wind te not only weeklig short of teachers. It's running out of logs a creet But there has always been a shortage of leacters and fectinology has always been used to ameliorate that—a fact that many becole tend to forget.

The Initi presi technological ad lo obsediation was the loads. You don't have loa chore teleshers to multiply them. The pirching press of a pirch hall and the mighted of all do transmission is the kergy the protect resource is now about to bosupplicated by an even more mereknole a discourse of inconvision as astendary of inconvision as astendary of inconvision as astendary of inconvision as astendary provided to they as books were to an encode specification.

Licen Bill recail my own annovement when at a NASA conformation lease that temyears ago. It new my first "dectorio stude tale." I was a prototype of the PP 35 demorithated to us by Dr. Bernard Divid, was president of interview Parciand. Though I was improved reven away in Chic red tably reflece that something revolutionary had come who the writi.

It is quite impossible for even the most

The telephone and car altered our lives, even the shapes of cities and uses of land Electronic information peocessing will soon work the same sort of changes ?

faresphere prophet to visualize all the orleast of a raily nere instratographic deveopment. The selections and the automatedproduced cases/the rails of the community produced cases/the rails of the community of the selection of the selection of the rails. They changed not only the estimates and only the physical student of anes of the land. This all happened mitter protections and the selection of the physical selection of the land. This all happened mitter physical conservations are all the physical selection of the land. This all happened mitter physical selections are all the selections of the selection of the selection of the physical selection of the land. This all happened mitter physical selections are also been all physical selections are also been all physical selections. The physical selection of the selection of the selection of the physical selection of the physical selection of the selection

Through here we not yet as important as books autionsial acts such as this more the firm of the projectors, and we compare machines are report periods and velocation to experience for developing countrials however, and i im not sure they are really worth the cabit of projectors them.

Perisps the most influential device of all to this activity television set, whether intended for obscalan or not. I d be now reled to know what impact Sesame Street has do the televisity free children of a totale different culture who see is here in Ste lanks SH, every TV program has some exclusional controlling the cultured and in a window on the world—include on many worlds. Other its a very multy world dow with a finited way but I ve slowly come to the conclusion that on balance even bad TV is preferable to no TV.

The power of felences nices not by so show current overse, often as they are happering. But for basic educational puipoisa. The value recerber is much more valuable its protagoal programs can be reposited at any conversent time. Unfortunately, the class of compound systems has privately on a data shares on the private standard standard and cheap mass conclusion.

Valenceper inscrimes however, are the to complete and here can area be maly cheep on long-liked here takes, which are response to the same hart here you have response the line area that they not make even of a transitional stage. Even saily we will have careforderly and other area will have careforderly and other and assage devices with merving parts and assage devices with merving parts and assage devices with an even assault of the transition of the test here are the same takes to be the here the device takes mercanics. In the same takes area to the same takes the test area to the same takes the test area to the same takes t

Consider the very breat history of the computer the first models was chursty grants thing whole rooms, consuming (kwaith of bower and coasing millions of dollars. Exday only 35 years later far greater lating and processing coesofy on the packed rise monotor measuring can be packed rise monotor measuring control that chip, not a couple of million collines but bout \$10.

The charge fire silvery begin. Comportended mittages is not wailable in mary American colleges and high schools of the disident to Talk. To a contral comparison the disident to Talk. To a contral comparison per vidents in this fire charge act, within may instantise time. The comparison of counter comport when the fire list is charge act, within may instantise time. The comparison of counter comtext is in hundred or situations result in neural yorng each the illusion that he is not expect that the comparison is infinally position. astronace, What a boom to sites or handcopped schemel.

Todays CAL conceles are big, espenree food intriu, usually waid into the onlege comparison They could be portable Amady businesteres in the mellion (be word) with attache case sized conclusion they call object to the completely portable and object to the completely portable and any Bail 11 the completely portable and the meet bill attache beyond today's pocket collable.

Tis proof yee is niready here in the tursenas of the affluent West. The first computer logs, many of them looking as if they'd lown off the spreen during a showing of communications.



This scientist-senator would like to see Washington make more room for industry in space - and get its own technological policies in order

INTERVIEW



schington, D.C., skil doesn'i know guite what to make NASA, surged into his pickup truck, and began a wear-long caming After all, the Senate has never before had to take the measure of a futurial, conservative, excaptronaut, and peological

Norway It NASA had prevaled. Schmitt never woold have been decided that Bight experience was the primary qualification for an the community won a few slots for scientist-astroneuts, and NASA

Schmitt was appointed chief of the actentist-astronauta in 1974 but he could see wide opportunities on Earth. He respond from this covered science and poverment for many years.

the larty-loss watchid surger sension from New paper in the Sensie in his return New Mexico, After sweeping the 70,000 votes in November 1975

When he took his seat two months leter. Sohmitt herun to pro-Softmit scawad his Ph D in gaology from Harvard in 1984, after volve the puzzlement that remems to this day. His voling record undergraduate work at Catech and a Fullmight scholarstep in could be a cerbon copy of Barry Goldwater's, and his bush Washington Yet instead of being a political sport on the ideologiastronaut and that a last course in geotopy could pripate its cal targe. Schmit is drawing more and more atternion as an aroculate spokesman for the future. He is the ranking Republican on the Subcommittee on Science. Technology and Space, where such Schmitto fx h1972 he and the other creemen of Apoth 17 his backtroard makes him more surproved than most of his colleagues with their legal and political onertation

Schmitt was interviewed for Othin by Caniel S. Greenberg, who

Gener: The Mara landar proved the power of a faceble microprocessor "brain" on board an unmanned space probe Would own will influe be not the science science?

Edurate: List line to be here with the toose the new Lochnoby prevails. In or make the exploration more efficient The combines the display prevails and the second second being and the second second second

Only: How do you rate the space program today?

Service 1 limit the space shufts longwith char toorhoughs we have visually will get unrowen is wately obtained by the here ad his 1905, for earning a weat applied work showing his work applies applied work showing in wately a satisfies for the power unwhence of contine hal with blood and public forwer bloodback goldy and mitigational information, remote weating with 30 Johnson we are shown about a work work and a show the mitigation remote weating with 30 Johnson we are weather when the the matching with 30 Johnson we are weather working with 30 Johnson we are weather work and a show the three matching

We should also be developing the technological basis for the rest steps in the sector operation of the rest steps in the sector operation of the sector operation sector operation of the sector operation technological basis of the steps in the sector operation of the sector operation technological sector operation of the sector operation of the sector operation basis of the sector operation of the sector operation of the sector operation operation along concerned?

Schentfl. I been consistent why that shouldn't be an option for young Americane—and young surflinger in general—in the 1980s and beyond. There is an accounting befortaal for periaders that could support them are well as provide Sarth, with initiatuots such as tamium from the moon, that may be in silert supply by them.

Maybe inside important, sealer rooms sents the load of inducions for the human spars that Narth America was three hum and years ago, a new similarial to the sont of teedom. Tsung people new set three manteries and the sont set of the sont durable interained in space and the frontier that is in the sont set of the frontier that was and both the people today used to the frait Mattant. We know just about energy in roy was set to know in the work how

Omni il you were writing our national space policy would you be planning a menter Man mission?

Schmitt 1 d be developing some things we know we'll need. A new propulsion system such se an ion or nuclear engine may not be necessary if you just want to got an

expedition to Mars and bring it home, but it will be valuable for esperitive stated to the moontor the planets. We ought to be working on that now because it requires a long lead 9mo

Other than that we need extended expenence with high-reliability space statistics assembling large objects in low othil, and so on. Dur basic understanding of the probains is good. After all we faithd we could reactivitie Skywb after it was nine meetins in othil.

Omny The proposed treaty on estilatrestral resources may affact some of the possibilities you we manformed. What do you think of e?

Schwitz, Hers, I think its unfortunate that many people interested in space and command addity in space and decided they e aparts the maty. I may end up opposing it, but I have I docated we all have to take a good look at it and decide whether it's in our national intered—mort in exclusion and look at it.) Is there inty-

> There's no comparison between Jimmy Carter's engineering background and that of Herbert Hoover, it is a great disservice to Hoover

thing we could do to modify it wa retervations understandings or amendments?

It is periginative initial discussion and immark aux when the Carter administration—or the next administration—will advit the Serves to conclude if BLC Im Oxford on it as a potencial opportunity not pill as Antercer treatly. The wolfing outcompose Antercer treatly. The wolf or Sen regulation—of or when the initial operation to avail or when the initial operation the test base in the concer while base the mean? We have an opportunity with the treat to the form of .

Ceses: How interested are your colleagues in these opportunities for the future?

Service: These is great deal of mercer. but its very direct to merce approximate approximate and grans from when the Congress We need administration initiative. Both Sensition grans from when the Congress We need grans and the Sense We need Sense Sense We need to be grand and the was an grant of the Sense of the sense sense when the sense grant and the sense approximate to the sense provide the sense of the provide an avail for a cleaner direction them approximate need to the sense of the clarks ad-

ministration seems withing to give us in that sense with the working to gother Of course, whether it is then year plant or a first/synal plan, whether we emphasize common development or government activity those are issues that he and I will have to member.

Owner: Most congressmen have been lawyers Do you think that your education and expensions is science and technology lead you to look at political problems with a different perspective?

Schmitt Meat of law deals with the effects of an ewart abort has occurred, whereiai in most other professions you in trained to recognize impainding events and, if necesssary to based or mitigate them. It was probtem solving approach, as opposed to one of moreix/ basins switching.

There aren't enough scientists, engreens, business people, declars numming for othos-people who are writing, whire one successful-concer to amilor succession policies. In the two Senato electrone tread with them there candidates from proressorts ather than the law but we read affil may all them.

Own: President Cartar had some engenesting training, he's the first President with that background since Halbert Hoover Do you see signs of it in his performance?

Softwise: Thought teen in yet accord in his affiging moving detail wing accord in the affiging moving detail wing accord in the don't think there is any contraction to here the lact fincability details of the ofboxed of the softwise the softwise the table policitiant which Carter is, but Hoover was a great hours related in a regulated over a softwise final moving of the softwise which carter is not Hoover to policy of the table which are enclosed and the policy of the softwise hours are policy of the table which are enclosed in the policy out to boxed with an enclosed and the softwise hours are policy out to the softwise hours and the softwise hours are policy out to the policy out to boxed which are enclosed with

Ottes: When did you make your own deck sign to go into pollogs?

Somital "Internative lists and the second se

I said to myself tess Scinicity, after 1 how some aspective an iny code III be in a pastion to run for office. To put my money where my mouth was, I begins to towe some surplus cafe which kept adding the by lifes a sawing a scorer. When I tasked for NASA and gat is travely occur. When is semeturisment, I had the habit of puting is ing this sawings account. After more commuted on the



The scale density of the scale

ORDERS OF MAGNITUDE

BY ROBERT SHECKLEY A survey of megastructures

in the universe GG233 PAINTINGS BY JOHN HARRIS







pervision anough as photokich power to light have client for an at dowards Blacker 2014 Tomoschet light have client as yet in 50-20. A provide the second of the monotonic light because yet in 50-20, means in the manufacture of the second Personal page bolive Balance Diversion on the second second in personal constant of the second second second design of CSC with our bolives horn above conserved second second of the second second of the second second conserve (sets) and and second second

Some infinities are larger than others. We found GG233 to be a relatively small universe.9







Adous, alth starved control reversion photos or builting Comparison near Alexandri A Model Big Comparison 100 XXX Comparison 100 XXX Comparison Andread Comparison Andread Comparison Andread alter Alexandri and Creatility although Adv. Alfored alter Alexandri and Creatility Advers The Alexandri pharting Linkova a It is consistent happend he Segment, who have hadned as say of primerie stronger year sizes. The Alastica Alagous a non-used to strong primerie hanger year sizes from Alastica Alagous a non-used to strong primeria. The Alastica Alagous and the stronger and alastica alastica and alastica and putforming montpage accusation of the alastica and putforming montpage accusation of the alastica and and putforming montpage accusation of the alastica and alastica and putforming montpage accusation of the alastica and alastica and putforming montpage accusation of the alastica and alastica and putforming montpage accusation alastica and alastica and alastica and and alastica and and alastica the league afficial work in the glassica path montpage and alastica and alastica and alastica and and alastica and montpage alastica and alastica and alastica and and alastica and and alastica alastica and alastica and alastica and alastica and and alastica alastica and alastica and alastica and alastica and and alastica alastica and alastica and alastica and alastica and and alastica alastica and alastica alastica and alastica alastic

Parnings from Mettill a new book for fail 1943, by Parnot Rublinning, Ltd. London WYV SLR. England

The Big Computer has enough capacity to project the megagalactic Gross National Product 9



UNIQUE YOU

Prospipals, who encount dozens of dibaset blood byces in the correct here baset found to societe smither abareministering ambodies with their convolation control of the society of the start of the society of the society of the society of the angeon rescleron imple the tole in metric on the correct in their therking the sparse metrics preventable deasase. If the sparse and constraints performance in the society of the society of the sparse and constraints of performance in the society of the sparse society of the sparse the sparse of the sparse sparse sparse and appendix sparse in the sparse sparse

Virtual) tensor before a set of the method in the background (which all information) may be background (which all information) makers be the set of the state of the set of antipens to the role in state background call tensoplarities and whole which all the sets instruction (which set of the background and the sets of the background of the loar groups), the total number of extination and the sets of the total number of commandation is approximately 20 million

Tanapatrznica artigere luncial, de presentas finite devilação d'artigere transferitados artegres de la dona de internostrutados artegres de la dona de receptas de la conseta de body wil receptas de la conseta de body wil receptas de la conseta de body wil receptas de la conseta de la conseta de organ de un legar la Serie Basaias such es posen calas actos activitaçãos de la conseta de la conseta de receptas de la conseta de receptas de la conseta de receptas de re

Recently transplantation unitgents have been partia another uses in solarity of an the beeloggitable but in the ocurritors. Beatures the orandom moderabilis are very unitkely to possess clark-cal anogane transplantations types are clark to reverso of clarks and rely Al an attransp has to data possed that child dear on the au particulation of four antypares that his parported farter would have sumpled.

In a second case, thed in Austra the use of these antigers were a teep further A women obmed that her drive wild wild an here to the estate of a clead man. But the estate/ dram and checked than antigers. From them they were able to doed means offare they end of the antigers. From them they were able to doed not strate plantazion type endprove that the plantal's civil could not have been avoid to him.

This one knows why we are born with tanglatitation antigers in the knt place. Surely nature could not have antioptend be increasing apphilication of the surappoints scalars! One theory comes toom suggests that the antigene code well dwalhad to enable the body to income who place to enable the body to income who place to enable the body to income who report any call but here only in the theory come review short the activity an income.

mechanism is unable to detect and kill an abnormal cell. Burnet's theory is one averue scientists are exploring as they try to unravel the foundations of cancer.

GLEANED FROM YOUR GENE

The ultravery typed distribution may be hybridgen to make a subscript from the constraints of the subscript from the compress Datavity is alreadype in the human compress Datavity is alreadype in the human compress makes and the subcompress and the subscript from the human compression is alread to in concompression and the subscript for the longitude compression is alread to in contention of the subscript for the subscript and the subscript for the subscript for the framework and the subscript for the subscript is and the subscript for the subscript for the resolution of the subscript for the subscript models in the subscript for the resolution of the subscript for the subscript models in the subscript for the subscri

In normal advectuals, there is INP which being must belowed advectores in a perancept in the case of her Y chorescares. The length of the chorescares which is a infrastry among different groups of million is againfault, the shores which is the length of the againfault is the story and Cauchsens the shores Whichar the length of againfault senses which which of the againfault senses which which of the device is expressed table in the length of the story of the story of the device is expressed table in the

Thus far harpotyte studien can detect only protect that an experimental and enternally local characteristic and another that percent of the population in black 2 percent of the population. Now draming forthight and internalized methods to identify the starting patterns - called characsimal bands, usu includualized ymmore our abay to detect minor differences in prestudues. Someday we may be atthen to analyze characteristic detections

While full unication of these techniques still lies a short distance down the solid scientists are already using identification methods that too far beyond traceprins

On Septomber 24, 1974 do indiando a Strange California, man wat convolted of menalizational allor in loss down that he pations of its leght lithed that bits marks and then womans rough its patients of 20,049 per time non-scalar here doublasted 50,049 per object contractantion of alignment and both notations: where 710 martitionly sareleded the down patients where the bit down patients with the object shifts.

The decisi patian company laverby with ingerprints in its unequeness Bacause each human table has like district surfaces. Hit diment dental areas can be classified by headdary formation, deviopmental attention mutual of harmatio charges, and the extgorthary combinetions and the extgorthary combinetions of proceidures used to 1600° of splace back According to computer models, more then 2.5 billion possible permission of these characteristics can be found in a dental print X-ray ensitives of the gave can add yet whether demansion to the process of sterithfordion.

Analyzing dental patterns is by no means a new science, fivel Newrit known more for hailefy to nide a force intel of dental patterns to identify Joseph Winnet, an American Nided at Banter Hill The Identry of John Wilkis Booth, Abisham Lincoin's assessin, was continned by defition when his body was estimated

Today a more applicable of a space transpresence of an another the space transpresence of an another the space transverse transmission to make a space to the space of the smoother of identification impossible Because topy manifer is one of the hardrest mensals known, this tabilit are the body motion used studies points They from can survive flery dissetters where other identifiable remains as deconversion.

Formps derivity we see them used matrixreportly to interfree instance of parsongers in the criefs of a DC-10 at Chrospis of DHaw Arport, in the meetingene of the marker of young main handlin John Gary Hang Chrospis and in the adverse of the Jonastown community massache in software is the Sin Diago plane orash 21 months ago, in which 14d people uses 14d of the vidina wear posteriori control 21 of them by their dental ponts alone

Wariang on the premise that to two mouths are alive at least one nation. Norway, now requires that identification terms in dealaters include law entercomment officells, physiciens, and dennitis as well

The hyperbolic field of the antimethods are used to chart the mouth, but all have the same basic features. Bick mood indicate serving or each seath prosterio divices, and the speak size, and location of fillings. Other measurable characteristical include the shape of the year and the position strape, and subcompt of the teeth.

Even the method of analysis has its limitations, though Teath change over the years, and dental records are obar years on a dental records are obary period of the charter and the second of the secon

SIGN IN PLEASE

If no two mouths are the same, realiser are any two seprestree: One needy do sepred system has made the seprestre a more securate means of identification them a page of handwriting, and more facilitation over than a integration.

Handwraing analysis has always been a painstalong and questionably accurate process. Charbe factors like mood charges or different writing instruments could disquee atmost any hand and farg-



ers could copy any style so closely that finding the genuine document armste bin purported wills by Howard Hughes could become an exercise in creative logic

Now however, Jood Semiter, a lormer college profession and locative of Conversational Bysian's Objection in the dwallogid a spatial end planos and outwit the event satisfit logger. He electronic system measures not the spatianism of the signtion of the spatial end of the signature but on prosesure on the wring san fact that locating and passion on the wring san fact that out on the passion on the wring san fact that the state of the spatial end of the signature to an approximation of the signature to the signature out on the sensitive in larger written.

Sternberg found out that, although landwring, and signature we hold complex petiens of learned balance. The signature is repeated so often that it becomes attests a pure tellex action, its puterts are ingraned in the "memory" of the muscles. As a result and which we can something in the disk or in a rush at the bank the pressure patient memory dishortwing.

When the U.S. 44 Food toxical Borntops anyoten as well to outside toxical Born-Topphy instruction and well to outside toxical Born-Topphy instruction and the second second and physical second second second second second and the regional cells is a physical second second to the space second second second second second second out in subset delays (second second cells and second second second second bact the subconstance and the second second bact the subconstance of an instrutation endowed second second second bact the subconstance promoting. In physical second seco

Even since human first began to gather in groups, they have recognized the analylem of identity larly on, they learned to endow objects and individuals with names. For a long time these unque webal legitutures were enough to give leach particule mesh of this own within the community.

In these dependentians layer however, nerrows have come a copper Mryono Unterioristic ensuing to be clubbed Smith-Jones or Johnson is lost errer of a faceless army of identically numeric pacifies have have base thermeanings. Our government, live most compatent, much perform to table how how the meaning of the government of table to be a set of the set of the set of the most compatent, much perform to table and be not compatent, much perform to the set on works of the set of th

Belogical tools are on their way to changing at the Natural IDs can be as seenite is mathests and more personal than names. Aleeosy they are employed in costemportic conductors when nothing can waitly disanguish one body from another Neady they are establishing individual sterative at some of our most sopheticated centres of research and resimand.

Interest of fercing us toward atronymity biological identifiars effoctively celebrate our absolute specialness. It won't be long before checking a chiermalione or tassa type will be a cerritrion as chiecking a signature is today. The results will be long hore optains and more autilitying DO

Heart Computer

Your heart can tell you three things that can help you live longer and stay healthier. The rest is up to you.

JS&A has never offered a pulse meter. And for good reason

If you we ever used one, you'l addy decover that your heat does not bear loc a lock it is regular it might beat at 40 bears permissis for one instant and at 120 the not Since meat public instant message with bear as it occurs, you miver hed confident that you re petmos a very sport reacting.

We also considered size. Exchipulse mean we eximised was large or oundersome and aniward to carry or store.

WE WAITED

We wanted a lewyears in the meantime, we decovered three ways your heart (through your pulse) helps you monifor your heart.

Pulse Rata Your pulse rate can fell you'l you are gating enough oxygen throughout your body. A high pulse rate indicates that your heart must pump faster to supply that oxygen and may indicate gaur ghysical condition.

Teggst Zone Your pulse can tell you if your teart to bearing test enough during average They're an average dated the Target Zone." Belaw the level, you're not exercance hand enough to do your heat or indentify spillen any good. Above this level, you can be interest adv near-each ow surved.

Cerclas Recovery Time The limit it takes to your pulse relation oftam to normal after your or ensergies in the real module of white the your or your elements program is doing you my good This time can be as healty as one minute or as poor as averal minutes.

The time things we learned convinced us that the ideal pulse mater must have the following traduces.

 It is wait measure a series of heart beets and simultaneously compute the average to avoid the strange readings from migular heart beets.

2. It must be small enough to use while ratespano.

3. It should have a bring capability to coloring the Cardiac Recovery Time

It want until a small Utah medical alectrons matument company oreated what we feel not only provides the capabilities lated above, but excells in other areas too.

FITS ON FINGER

The unit is called the Pulsetach, and it fils right over your larger it wright issue than an ounce and can be worn easily during most categorie organizes.

The targe fauld orystel display can easily be seen in normal room lighting or hi bright surlight, and boxisse liquid crystel display consume very Kills power. The readily-invite Robe weets batteres will sail for years. Publicity, automatically surss statif off in two mentions if you larget

The heart of the system is a powerful moro-

computer CMOS servi-conductor integrated oricus that will take up to 4 pulse beats, compute an everage pulse rate, and then tash that note on the liquid crystal dealer.

FINGERTIP SCANNER

The sensor consists of a Garlium Amerida infrared light-emiting diacle which scars your fingering hundleds of times a second to determine your pulse rate. This new system is one of the meat recurste red is allocitated in apphilticitated hospital systems.

The unit also contains a quest-controlled timing docur which will accurately time effect year exercise period or your Cardiol Recovery Time. And you own switch back and form between the pulse and chronograph mode while you are reamcours.

We reade that the Published scenets like a very ophistocend unit. And it is But as ophistocend at sustainary, it is an octarialy case unit to operate. There are just he outform to press which operate the public reading and the direcegraph temp crout A field butter espaces the outpot onkill.



Ine Postelach system na comorsky on pos loger while A monitors your howt and date mices your Cardiac Recovery Time

HEAR YOUR PULSE

The audio circuit aimply bees every time your pulse bees. This teatre lets you more flor your pulse by heaving it is you nun an excrete and it can be shut off by preveng the buffer is a second time. The timing circuit is calanta-controlled and cohome's records.

The Pulsetach not only has contented all of the most advanced technology in an extent of small size, but it outs less than many other systems lacking its advanced features.

The Pulgetsch can be used for pogens athless, all forms of exercise and ever cardso recovery patients, as it openates quite effectively with pocentaivers

REAL WORKOUT

We suggest you order a Pulsetech for our 30-day no-collegation trail When you money your unit, give it a real workout Notice how atripic h is to openate and how ethicly you



can read your pulse rate. Use it to stay in your Target Zone and to determine and then improve your Cardiac Recovery Time

Monthly your Candiac Recovery Time Determine your Terept Zone and see If you're really corroang in that area Then uae the Puterisch to welch froze Importent signs slowly improve thereis to the accustoy and informates way out from the unit

By knowing the important factors that help you monitor your health, you'll led better, exercise more effectively, and many dockers hely optit live known

TWO UNITS AVAILABLE

To creter your Published puiss million, send your check for \$119.86 plus \$2.60 persage and handling (Timee research and Dr's sales tan) to the address below (Allow 20 days for personal checks to clear) Code and buyes may call our told inter number below

You can also order the more expensive hospital unit that exercises 16 bests and has all the features including the small size of the previous unit. If costs \$149,95.

We'll asnot your Publishedt public meter complete with 00 day limited werrenty and instructions which include information on determining your Target Zons, Cardino Po overy Times and other helpful internation

Then after your test, it you're not hely convinced that the Pulsepach is the best unit of its kind, the most conversent, and the greatest weiler, extrum helthin 30 days for a prompt and opulseous refund including the \$2.55 charges for opstace and herefind you get it lose.

Vour Putertein is traidy attid-tates an service shauld neuroberequired, build tates an service shauld neuroberequired, build fills, the menufacturer has a national service typitell holdity becking acht und .88A is Ananoxi largest single source of source-app products - Author assurance that your Natestah is backed by a substantial company.

We ve waited an exhibition time to jump into the pulse monitoring held. But what a great entry. Order your Pulsatisch et no obligation toder.



INTERVIEW

than ten years, when I trially chose a time and an opponent for my run in New Maxico.

Omst. So your political plans were there all How much truth is there in the?

Schmit: 1 think that people were so used winding down and opportunities for flight were coing to be very imited, he decided to become an evangelist and has been very succeedul at it, although he almost killed tempel with a couple of heart attacks F/I Micholi had been meeted in ESP ever since his graduate work at MIT 1 thinks and we talked about it many times before whether there was a scaurblic basis for ESP that hald that it was different to senarate the wheat from the ot off. Buzz Aldrin had a crychological problem, which he's applier goal behind him that problem anneared in

thousand Americans to put men on the posed to that motivation did have a profound effect on me, although my interest in

Omer. Some politicians have always press by making fun of scientific research.

some fundamental research that's being for example, may be held up to notcule because of the title of an article. Scientists should try to communicate beller of that - but there are some protects you can't is a sensior or congressman who doesn't understand that and warts to ridicule it unfortunately the press acros on F. More cause of a lack of understanding of what

Omni Has the scientific commanity

Schmitt. In part we've let ourselves be come captive because the majority of msearch turning is now coming from the OF DMN

funding means less freedom in respansity. # We need both, or else major assay of su-

Omni: Do you think that science and technology should be exempt from the peneral pressure to hold down government

Schmitt: I do because investments in scientific understanding and new techdatationary. They create new productivity. tional product without increasing the money supply which makes them some of the very law inherently deflationary function the federal government can do

Eundementel research is being held up now because some of my fellow congressmen hold up to ridicule projects that they don't understand, and the press iumos on it 9

Omni: The combined lederal and provale-sector expenditures on science and amusity which seems live a great deal of money How and where would you increase spending?

research and development this year was next peneration of wespone systems. And or expanditures that don't really on into two costs and private-sector sponsing in ments rather than increased productivity

Look at American history. Our major vancement have followed the deept of inch rect mection of new technologies, from the world wars-unfortunately1-and the move after a period of technological expartico. But we haven't been doing that

tor the last decade partly because of a oversuming tael and damaging the environment ronment. We must look at the side eftechs of setual we do, but we can learn that lesson without coming to a complete stop.

I think fundamental biomedical research should be funcied at a higher level, because it can lead to cures - which are always less of an economic builden for indibe doing in theoretical physics, not only interest. We cannot alford to find suddenly crack some of the mysteries of physics and

Omn. Is the administration pursuand solar

Schmitt | don't thrik so There's a good learnes for development of the many differ-

the power-lower concepts, but they re further off than some of the possibilities of combining solar with gas- and oil-fired or even coal-heed power plants which could move very fast with proper support Petscal lodas, are actually discouraged by and HUD (Department of Housing and , Urban Development) doesn't seem to be able to integrate them into its deteors aren the applications are taking off in spice of federal only rather then with its aid Onver. In what ways do you think the gov

Schmitt The main living is the policy decisign that when a new technology finds its for example, satellites have revolutionized Technorally lowcasting has been a dovtronic mail commercially viable, you moht

give it some working capital. The market sees these. the technology was there and it NASA has committed itself to use the new direct-misy ratelite system developed by lower the cost of operating the space shutas a commercial system from the beamheipful but not really necessary

You have to be willow to measure the amount of private-sector activity in order to get maximum service at the lowest cost

Ommit Lefit totk about the economics of intheba semany and the date is providen. The United States has sneased the wideat possible deservent realised Exchine securices data from satellities, but what if a satellitie spots signs of a valuable geological formation outside the scantry? Is all information oblighted from space part of the "borrmon horitige of mention?"

Behmin The new biaservacible generally evaluate, biased on the cash to the genemmern of obtaining them. If a fact onnewal a dua base developed by the privite sector you'd acid an appropriate nature to the investment. As for the next step the processed information that has to be outdoed to the sector of whith the based both that used an immeral exclusion be too that a used an immeral exclusion.

Magnetis base example of a concelesp paths parsons the estimation of the worldwale yields of varius cross Practice to the vortal all tags, besizes in the series many more than the series of the series may more than the series of the series and gata a well as the concrane cycles and gata a well as the concrane cycles the characterist from pations. The world is transmitted a series of the world is transmitted and the series of the series transmitted and the series of the series of theses. Series is and Australia, and crop scattrales from which is ensured as well as a based series of the series of the series of the scattrales from which is ensured as well as a based series of the series of the series of the scattrales from which is ensured as well as a

Others It's incouraging to talk about shared benefiting but technology also beings some disard problems. Recently we variant some inversalls of classic poth-bornel attruites Localisios are rotuing to talke on whist they see as instand problems such as ruchas visited objousi hit his post your south the Nuclear Regulatory Commissions dealings with the space your south the Nuclear

Bernari, Tiny, and les The people keep geting occupier of quarte by announcements about the wash-of apoul experiments that Guideau attacked, close flavour mark that Guideau attacked, close flavour ben how to observe and legal in the close team how to observe and legal in the close team how to observe a develop in the close ben how to observe a develop in the close ben how to observe a develop in the close ben how to observe a develop in the close ben how to observe a develop in the close out in the open here are it a webserved understanding of radioachety or of the nais and benefits of radiag power the openement conception in intravioles the

Dense What about the Market Segutary? R appears that more and more people in your neightor about to Market Segutary? If appears that more and more people in your neightor about being insis to that syslem descript the morey L would bring into the local economy.

Solvrift: I think the reason to one is happy is that if's a slupid ides. This ' received' or 'honzontal dash mode is just reliquidus' doesn't consider the land of strategian ora-

FOR FUTURE Reference

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tection of mostle system should it's memain coally alternative and it's going to have a thremetocue aniverantimeter impact on the water and other resources of the Southwest I don't know if much can be said in land of Cahler schedoportourse that boe mg mode and i think eventually the Coegenese te option to save no to it.

Onver What is a minimum day to estream? Setternit I inter is a reportant to get an assembly line going for the NX. The merfets contrabilities intailly with replacement of the Multerian, in the same side and inglase with other allos or even during slids. That would be a much mere excention way to get through what I hope is a transition period, well a time when through others in obcinger board daily

Onnel What would be the next bees?

Seminar 1 would live to see us replace instability amount distribution with instaally additional problems. This is a certain all additional problems and the second second seco Scientifi There is no question thet particle de beam torchologies can be developed athrough its not clear that they can be mice aparticitation for character purposes We have to assume that the Soviet Unions as pursing R and D on a blood hord, we le certainty active in lear technology But I because to assume that the Soviet Unions technologies are assumed in the technology horder to active an assumed that I will have an advertage in pursing theory into practice.

Ame: The Chinese are seeing our coopariation in developing their ecentric and technical rescuroes. Should we respond unstantingly or are there specific areas where we should be carriful?

Schniff, I limit we capit to cooperate prefy freely ecopit in the most anearenew tacheologues. Chana weintraally will become an extendinarity power thin laten, and we may end up as competitore, but an person its class that the value concentration person with class that the value concentration person with class that the value concentration person with class the concentration of the school and the school class the school cooperation accent can ask a builton person back them.

As for as the Chrises Soviet initiationship is concerned. The Chrises are detersivemended. It an initiar present concern about Soviet intentions that we have our greatest. Westige, and it may be that U.S. "Chrises or Western Chrises relationship contains elements for a much more stable world stadeon thm we can near magner DO



New products almost always look nice, but they often disappoint—either because they are overpriced, don't live up to promised levels of performance, are shoddily constructed, or are fraudulently perioted.

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Giy San

TUTORS

Saw West presided the shops last Crime mass They play torticables, childingly jou to sprease antibibities and the shops and the play shower — making sub-childing in the sweet of the shower and the shower of the able to westlife them sweet from they and they is westlife them sweet them they to able to westlife them sweet to they able they is 1970 they calified in own they able they is some they calified in own and any separate in calified to the states.

These pic type, but they represent the week of the Luke Much more septemcalled and the poolet electromic translass index the poolet electromic translass the sector the sector discustors for years our lead When you type works and phrases more at the alternative septement. The tondaltion appears on a small protein the Utheren models. This latest models of these machines have even learned to these machines. This would learn to be channed models they may have the lead model they may have the point control source the much applied to a control source the much applied to a control source the much applied the control source the much applied the control source the much applied and the sector the source applied to the sector the source applied the sector to be the source applied to the sector the source applied the sector to be the source applied to the sector the source applied to the sector to be the source applied to be the sector to be the source applied to the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied to be the sector to be the source applied t

Such devices would be specialized versions of the general-purpose pooled future which will be the student s unwinnial bolts arrupe subject that could not be programmed into here devices all alwaited operationally that the able to change subparts or uppace coveres merely by able data proender the state of the state of the state and the university as you can in todays a reversionability bis you can in todays.

Where does this leave the human teacher? Well list me quote this dictum Any teacher who can be replaced by a mechine should be!

Burling his Model Ages many scholars approach princed hords with addelingtion more participation of the addeling of the base more part of the clean the main finance base in property or incoded eage. Where add addeling the second scholar addeling the eage of the second scholar base of the Addeling water context. These of the addeling water context, the of the Addeling water context. The delete water product and the second base of the scholar base of the participation of the main scholar base of the participation of the participat

Nutthe teaching protession has survival for invention of books. It should wildowin the development of the electronic little velocity and the strength of the strength solution receiption. Instant unavestitide in somach balan electronic it promoves the solution protection of the strength of balancing more than a subscription balancing paradoxecally. Turnan ze doctaon if a teaching feels threadment by them, has a survey in the wing profession. We need mass education to strap the world out of the Store Age, and any setchology, stry machine, had can had a be to be weather and the start of the provide south of the start of the start provide south gradient and the start of the start of the start of the start weather the start of the start of the south of the start of the start of the south of the start of the start of the south of the start of the start of the south of the start of the start of the south of the start of the start of the however more many departs and the however more many departs and the however more the start of the start of the however more the start of the start of the needed to be any start of the start of the needed to be any start of the start o

When assessment takes mean takes mean takes the observation means the assessment of the rest of the caretary in the handbacks of millions and cost remost than todays, possible careful takes the background of the takes takes the takes the background order takes into the takes takes the takes takes the takes takes the takes takes takes takes the takes take

Assistence does this leave the schools? Analysis telecommunication is making these answer instituores make making these answer instituores makeriation of space Summa Scientary and University of the Ar can be heard the from their came puises. The pocket that will complete the processis giving the student complete the cam of choice in study time as well as in well location.

We will probably still need schools to paper obtained the social islike and checkpane they will have as adults. But reresenteer that educational toys are such furhat ther young operators isometimes have to be designed loading and socialming ower there they adminimized interver.

At the other end of the spectrum we'll tail need unevailable for many functions you can to be otherwisely perform on geneening without lats, for obvicus rule areas and theory will be noted on time global classes even at the paralistic lived electronics can new companish converse all the numerics of particular interaction with a capable teacher

There will be mynads of "investie colliegen" aparting through the gkbal communications networks. I service a single the thet provide the network of the period of the a machine about the offen the period by a werther theories in walks. If it can be replaced by a global electrons network of computers and salekte intel

But there will also be notices where compares still easi. In the year 2020 many housand or students and instructors will still mail in person as they have core ever since the days of Plato's Academy 25 conturne sape CO



know even think about it ever-and sudthe very possibility the fact that there is

No es impossible Linsiated What about people with dangarous jobs? Attain

There are no such people she said I

for me I thought to stometh this new world And suddenly came a reliection with this studion purely as a theoretical a kind of disfigurement.

"New I and "I's sinearly very late i

- What?

I want up to hav took hold of her bend on full back, her teeth gistened. I did not want not Nothing more Her eves were closed.

my harvis

Im open now I amounced She said

else. I looked at her and felt under growing mme To grab those whole maked arms and

sat try a fountain or perhaps it was not a spreading light of the new day until I woke

In the doprive per's box, which resemwith long, delicate arms. Without asking a signed it and tode up with a small thangufar ticket. Someone - I have an idea who-helped me open the door of rafter the fearny carpet and immediately list a window turned out to be a television set. some grant face was grimating at me meditating over me laughting chattering death, in it even time stood still CO



MARCHIANNA

Alone in space with her adved invisitel, she always pave hm exactly what he needed, and then some."

BY REVIN OTDONNELL JE

The avoir to music fivery

$$\label{eq:theta} \begin{split} & \mathbf{U}_{\mathrm{eq}} \text{ makes the maxis } \text{ Ferry} \\ & \mathbf{U}_{\mathrm{eq}} \text{ mass starting of a starting$$

From any angle, an infinity of squat, lumpy Machannas stood in line to view her, to ploaseher. The lights dimpled on her armor and lunied her orcults for the days run through the mining bet.

But first breaklast Not for harself, no-Marchanna aways drad al frecoclinging easily to the steed-gray hall of the prospecting ship and soppling up sunsign-butter har Nakamuta-san bermaalist by owner her god

Theory in functional of a cabband course avec, or is account on the motion of a sector in a scalar on the motion of the point of non-theory and the scalar of the motion of the scalar o

Yes Marchonnes difficient

Becarrying to the braidfast more beyond the income network the table free of the dust that overright had situal down from the nock calling. In the wall-hold organized a perior too, spoul of trus's spanse of reliades before it posted a small cross which a long legged cause probed for microses before a posted to microses which a long legged cause probed for microses as a line and sign whenever he had to be the cause area.

⁷ 50 T2 Weinlerg back into the Mitchente classic d10 bacyter tray-thickwith an (bloogram initial in mother of-built) tool assed her owner what it means and he hadrot known-thron ananget the planning nation. Nationational housed over such throug Cross in the beginning of their networks and such the displand at aster train each such is not drog presented and such the displand charge national such that displand back to displand there the displant the such that displant the displant charge national such that displant back to displant the the displant the displant back to displant back to displant the displant the displant back to displant back to displant the displant the displant back to displant back to displant the displant the displant back to displant back to displant the displant the displant back to displant back to displant the displant the displant back the displant back to displant the displant the displant back the displant back to displant the displant the displant back the displant back to displant the displant back the displant back the displant back to displant the displant the displant back the displant back the displant back the displant to displant back the displant back

In the damp point intiget whileheld Put her matter has come. Sha checked the time... 756 55- and instatched up the may and busited to great time. "Dhay and busited for in-mot out- while alland the pressure in her cab's independent suppraises all name the tack while a cospe of dominenters and tilled the loal cost of the supervised to the superal cost of the supervised to the superal for the supervised to the supervised to the supertation of the supervised to the superdiment the supervised to the supervised to the supertion of the supervised to the supervised to the supertion of the supervised to the supervised to the supersupervised to the supervised to the supervis

"He "he granted Wheels whirting he

value to the table. He opposite remontantings they with such as which load if in the transpare same -focused on the bod value. His work for management and the ring in a dozen transite stratistical with poor or a Amost before share maked which the was dozen the singpool work model which the remonstration of the singpool work works of the table state share maked which the table the categorithmics maked from the table state of a table of the single state of the categorithmics maked with the table state of a table state of the single state that they stated in tamenous disequilibnear Table time. The single shares

Nortication floored from her motion processory. Steld shown she shouldn't have attempted a human art form, but her ache for him to look flavorably upon her had overwhered her programmed confridm sense "Lapologne. Nakamu-baan in the tatare Laft lever my dipol

His tog lamps flickered in surprise "Did you think I was castigating you?" he asked perturno for her to pour the top

To say yes would have violated the own enrespect oncuts. "I thought six that you ware remoting me of my machinehood

 She didn't like to acknowledge the smit. Like hersail, it was a device for man's contrort,
 but so simple and shallow that it made her race look bad in all human eves.

The, next sit all "Timough a copper reption: hearspeat the bearing ten this microsove delth moved right, then is? Indicating the optimal." As my venerable grandlatter chan said, asyone can become sin alloid, band, and a litame to devote hor "too de said. for a begrone". With the microsover the said for a begrone". With the microsover the said of a begrone. With the microsover the said of a begrone. With the microsover the said of a begrone. With the microsover the said of a begrone with the microsover the reality value. After a moment he looked spir "the may oc-

Leaving the left lights than at Police from Navamura and Unprecedented – and this opterang, separately consider ong the summark hid shown on their test music. Shed though their he was casking, going income, but he watch? Bhot been wong, and har happings published been wong, and har happings published began to hum.

But in the kitchen she beside herse? She was a machine a devoie a tilvigmetal and platter assemblich tymerich her plassaw. She ted no ryht to low Her me and/or to the she was a solution of the state of the she was a solution of the metal accuracy - not with effection Nekamura-san could sell her to any mometal-or cover the miss a Willipettion?

he welled-for a human owed nothing to his possessions, nothing.

The sine dial loss ceeply and say set the could not replay that 3 he control want to help that 3 he notative that and the set miner which an early cycle per second whenever takamarkets never 3 he is an used the citype when tests and of the deaderso acrossity with the closed he that, whenever the threshold what the early that whenever the threshold what the state of the count of the closed here that an experiment of which want any phrase second with the closed the state of the phrase of which want any phrase count of the closed here and the state of the second second second set phrase second s

Be east also controls, the the travele lowe that and hop been later to hit The factory that and built the capacity into their Three means had the control, mutuatis of to mean had the encount with never the later and the encount with never assistency after her steep tithe called it has though the mission provided of encourcentar teacing, the had head the vocaseen her lace and his fame had loged behandling the fame had loged

Marchisma, he called impatiently troggring a feedback effect that rippled though her like the aftertremors of an orgism "it is time.

Their Desire puring shall be the bolt the scheme and tailweal man a distance of times and tailweal man a distance of times paraleses cornolds operang on the air statistical surface to the here cornol intending tailweal but both the scheme the manual states and the mann the disposition of the state paraly the distance and the machine man codes and explained on the pask. State base manual states paral them. Nationacces in states of a work plane. The scourds of the space them. The scourds of the space them. The scourds of the space and the state of the states and the states plane. The scourds of the space and the states are states and the states and the state of the space them. The scourds of the space and the states are states and the states and the states are states and the states and the states are states are

It was a monaticus thing. At almostcube five handhad maters on an edge with types have and struct there and errory spaces in between the Azaba Maru hed cett a quarter of a talking yen. Another hearty years would press before it paid to rised correlated.

Nakamuta san rade one elevator to the bhoge, where he would shed his proxictive gear and error the shall eleve environment she mounted another elevator, which ramen her to the certaflace.

She had barely finished checking it befare the voice sounded in her radio. Cablas dropped, fusion engines on brace volume?"

"No. sr" she repled then victuated in resonance with the ship's spowing of gaseous significant in the solution may from restail Vacuum scores round, but the chan magined that in an attainaphine that onging would have toared would have beloaded would have deelence away all within a hundre kilometors. Origing 1110

to her perch she watched a situt occlude a slat with its quivering like a signal light - on oll on off . The certifulge has cooled, set she tadloed when the asteroid had fallen far behind

Then get the plug out. You know what to do

The grathess of his tone wounded her' it was unlike him Nowever life was official for him. Is self-work to the Actional date the endered on the point's of nowher, mithons of kilomaters than his high right, her home. She knew how landy it was She had in one of allowardow.

Sungifi tertimesis a moring mist drifted soross her plang Har photoxitiscs collected in trateforming & into the just so surghy res. Namb baard issues drifte her der that gethers on 4. Dhe plannadher route to stay out of shadows. Full batters date her

Moving with an aginty remarkable for her size and shape, she operand the causing of the torty-meter-long centriage tobe and radioed the crares to hore out the solid/ad metal Simpled on their last tip home, pound into the type and isourcent the considurant cost has separated out into neal state. Into some science extensioned data of the took.

Summoring index datas sha tailed to the fat end and untated the posed covering her built-in lass. Then sha plugged hereaft into the shape main power supply. Her bortimes use coprocess built agreedly light infore would often them in a huny. The current surged through her Austria. The wanted to three weaks comuch to be done. She rode the stready epsits built was as omach to be done. She rode the sensal waves the a most possible even in certail.

Proceedings unservices are services and search search one on a log layer having the services of a most dots, and the services of the services of a most dots, and the services of the marks. Show and the services are services are services of the services are services and and the services of the services o

Pior Alexandre sen the thought as the wall to work of the need statum the waves but how more than the culot so that work without is independent on the that the culot so that course to an astronomical calculator. The work pity was crossed on one of Marchanna's volchips she show no maximg but could have impairs astronomics. The websit the could for the mostler was survey to be pixed.

A lone equiption in the ball only a robot to company who are anyther interactions one which who have the ball of the of a settled who, there matters needed more which the "lack description of the settled and the settled and the the settled and anyther and the settled and the settled and the settled and settled and the robot is the taken as an additional the robot and anyther and the settled and the robot and the robot and the settled and the robot and the settled and the settled and the settled and the robot and the settled and the robot and the settled and settled a

After some thirty-six hours the radio crackled. "Are you toshed w?"

"Net: Peruched she tooled his question though her inbuilt vace-stated analyzer. The summary fisched Growsh while the emboral-component charter totaled up a list of water periesson Lossinness Trike technical provide queby within one twottethild a second incompleted the list and the pueb-hoth perior outbiologia watery of Sup

Some like it cool.



messionse the cool mountain all deep to the quief streams of the kind of man Timosrine...the

cent of the

Industry (and not have been in

gested therapeutic hisponials. URGE HIM TO THIS, PROVIDE

"Har Emergency? she wondered but no as she tapped indicators glowed greent, all readings read normal Just his mood poor man I must make him happy

He spuri on the treads growing. You have a portive gift for

No he snapped

"But you haven t unsured

manipulator at the control panel. "Why did you reprepriet the

"Nakamura-san!" Aghaat, she jerked back. "It is not my place I would never after-

What could she do? With a soft "Harf" she put herself in Empty silent unforowing space. It shaftered humans, sucked stolated and vulnerable & counted them with the serioht of

Ahead swelled a small asteroid, they guarry for the day The ore albedo of its othed surface sellected ittle bolti. Mar NakaThurg-man siguack raflights had asked him, but he direven

CROLUD & certameter at 8 time until the vessel is paint mouth blansim malace bit down on the rock and began to grind. The

You or slow today," he rasped uppleasanth

"I am sony Nakamutaraan she replied even as she

Some like it hot.

WIND DR

NEXTOMU





Contraction of the local division of the loc

104.77

THE UDMATE ATHEFTE—Compare aphysication and psychological statistics as mobility with disflexional gial and distancements for contra an average particular carlles in every ideal for signmene performance. Coactine are become severeds programs and registrery there altheas more porcetly harvey testere. In the AVER and AVER and AVER and AVER and AVER and AVER and the future of all following our order locate more with labs for allowing at the future of allocation with sources were with comparison, the interfactory of the future of allocation with sources and with a source of the future of all and the future of allocation with sources were with allocation of the sources of the future of allocation of the sources of the future of the sources were write the sources of the sources of

PRESIDENTIAL POLITICE-Met month we present a time pour public music present publication and annual time or consultation musical fraction and encounter of the present of the present of the present of the public of the present publication of a displant on the policy decision research and development candidation. The measure and up in the present and the public of the music candidation. The measure and up in the present and the public of the music and the base of the present of the public of the measure of the present of the candidation. The measure and up in the public of the present of the music and the base of the Direct Development on the time and the public of the measure in present of the measure base of Direct Development on the time and the public of the measure in present of the present of the public of the direct of the public of the measure of the time of the public of the time of the time of the public of the direct of the direct of the direct of the time of the time of the direct of the time of the direct of the time of the direct of the direct of the direct of the time of the direct of the dire

The ILLUSTRATED DURE—In his cheers move for which has involved both the logs and Notivawards. These hearts involved makes the red move set of the magnetic set of the magnetic set of the dense set of the dense set of the dense set of the dense set of the dense set of the dense set of the set of the

SCHENCE FIDTION-Julys Over storp teaces Suphan King to bot deling pathod The Sking and The based Shis III not activate a constraint of the Sking of the Sking and The based Shis III not activate a constraint approximation of the Sking Sking Sking Sking Sking Sking Sking approximation and Sking centriluge is now filling and the process will be done before we get forme

Bo light an entil work of the bor too much a finally the photom That denil days all way the photom That denil days all work of the photom that denil days all work of the thous of the terms as days of high, or blue, if pullin you packs and work that and work on your back as it danse your haps and the more ruscling nooe datates and Paysman akin likes manage on the horizon. You have a backness of the horizon. You have a back as it does your haps and the more back as it does your haps and the more back as it does your haps and the more back as it does your haps and the more back as it does your haps and the more back as it does your haps and the back as it does your haps and the photom of the set of the set photom of the set of the ship way more of a with, I-1

He ranted insurely the rest of the way back. The orushner cut of when the latal onone-has been ground to power the provide highest to gob and closed the grossure untrolle. The cuthings span mady And for a day and a half Machanna dwelled on the work to were or welled on the work is memory, and hall inflications, because the action lead was beyond her.

When their base roled into view and Nakamura-san began to decelerate, he told her, "Leap into the reaction-mase eshikabitube"

"But that will dealtoy me " she protested though she began to pick her way down the sibling to the rockets. "This temperature the velocity of the particles..."

Trachy he be of 'Do et

She stached the base Duly the propelled hennet toward dauth Even at a hundred meaks the hast tropped automatic warrings Excited particles decharged photons on a billion wavelengthaa million cakes. She'd last -a toocont? Presse is be begood vou can?-

No

The is wrong. You need me Dec. stang

Deep within har maze of circuity a relay cacked over She stopped. Pity material ahead of her a glowing, gespoun ber rose to the surface that borned overhead. She awarded and said, "No

Oh The radio stayed silent for lifeen seconds before he added, 'All right '

Sha triggered her internal chronograph. There was plenty of time

Heatlights Dicking with excitement, beat bundles to the coverces startworm being to assess the coverces startworm being of space parts, all reach boost, shod on one another's shaulders, shod on one another's shaulders, allowing to appropriate charges the object of the programment of the term of the term has been to the term. Winners of #10. Someone should offer a prize for these

COMPETITION

By Scot Morris

As protochave been offend for a human-powerfall gint across the englan Channel for a buyde here of angle basic than 56 millior period. The metabolic electric motor crisis soft fourth of anneh on a walk for a soft feature the Attantic, for a white manged and for escharoth Period. Serial Soft and the softwarts and the softwarts and the softwarts and the powerfall (TPR)

In Competition #10 seaders were invited to suggest a doarn they would like to see realized, in a resident may would like to see that could use it push in this form of a prex. Somal readers suggested breasthroughs to produce the table and a prese prese and the could be a prese and a prese prese and the could be a prese and a prese prese and the could be a prese and a prese and the next the damage of the damage of the next the damage of the damage of the damage of the table of the present of the basis of the table of the present of the damage of the damage

The commonest suggestion was for an asyrometal not connected with any government to be launched into Earth orbit

Many entries included detailed ontana delayeeing the conditions that would or would not win. We can only present summaries before

Someone should offer a prize

GRAND PRIZE WINNER \$100

For a mass driver coppoler of driving an eight penny mal flush not how-inch pina. The fond of mass driver Gentred O. Neillies falling about for work in outer space. sounds to exolence for most people, and the concept should be brought down to Earth. It would be a great sharp forward to byposs the hammer and apply the power directly into accoderating the nall

- James Countriey Appleton, Wis-

RUNNERS-UP \$25

For the answer to this proceen A large number of points are nandomity ploced in a square. What with probability india any natiograph choose point is the nearest resplore to its reserved neighbor is that is dream with an analysis neighbor pair such that each is the nearest neighbor to the other? It is every to determine that

- Danici Pishne 1038 Nimitz Lane Onorman OH 45230

For the first to launch into orbit an object of any slated mess by leng propellant entitle to that mission

Frank Reeves Ansiev Alz

For the fest propellar-driven amplane to fly laster than sound in level light, — Caro Ziemermer, USS Maratz, FPO, NY

For the first asplane smaller than the bee hummangbed which has a wrigingth of three commeters and weights two grams — Wilcam A. Kien IV. Ryd. N.Y.

For the first person to develop a selfcontained and with-autianing amoterment of invigitings, including at least one kind of plant and one kind of ammal/tomentratiopopt). The enatorment must be an and watertight and must least ong enough to prove that a life cycle has developed.

-Glonn Jonkins, Kont Wash

For human-powered vertical fight a devocrite enables a human being to hover three means of the ground for one minute, under his other own power — Frederick Neemann St. Louis, No.

For the largest amount of protein harvested from one scriulin one growing season. To be an arrival award

-Tim Flanagan, Portland, Oke

For the feat pieceson gain cart yable by one man that shoots infolled ordinatly eggs and can be a larget 25 defamiliers in dameer at a distance of 230 meters Such a gain would be a conselentable advancement of the air of normitary weaponing or defailing.

- Friz Hagemenne Marich, West Germenne

HONORABLE MENTION

For preal this electromagnatic radiation can be transmitted faster than 186 500 miles per second

 --Kenneth Warson Sacramento Caki (Ed. nota: Wikinson enclosed a dollar bil risorbed, "An breaking the spead" of light "Dime has matching fonds available -lar alignee who with the pole 1.

For a solar powered ball that will not roll down a hill of 20 degrees or more include as long as the sun is will ning. The ball must be completely self-confained

- Charley Lineweaver Providence, R I

For the linst person to stop completely the He processes of a rhesus monkey for a period of one manifi and then restore the monkey to perfect heat hand then lead use Wis

- Scott Paul. Hoa Lake WS

For a water vehicle powered by the hydrogenand oxygen it extlacts from sur rounding water

-Scott Celley USS America: FPQ: N'h

For a computer program that can play the Deama game of go all the first Dan lowd. So is an amount geme whose rules an very imple but whose strategy and tacks are thought to be more complicated than those needed to play chees.

- Allan Tenneni, Glasgow Scotland

For the first practical two passenger whicle that can achieve a mileeror supassing the magic number of 30 miles per patient. Deving must be on public marks within posted speed limits, withing beginning of the run, though flywheels may

- Drvid R. Mothat: Price City Million

For a demonstration of superconductivity peniture of dry ice

- Devid H Herrmond Decham Masa

cross Lake Michigan underwater

-Bey Fegarty Esdinatori Mich

For the first single-stage rocket to be lausched mit stable Earth groß

-Fiel Durnoit Wetergion DC

For any proof of true televinetic ability En a class box. Have test subjects exert tele-

pad of paper Kreskin offers \$50,000 to masky cause the pency to write the letter K to arrend who could mentally make the

For the first woman NFL football player -CarnelLeech Columbia Mo

For a heat-sensitive roofing material that

- Gerald Wayne McGuire Tempe Ariz

For a compound that when spread on a short will prevent srow and ice from ac-

-Mary M Gregos Wilknington Del

For the winner of an Omra Compatition in which entrants submit ideas for future

For magnetic bumpers on cars, with only

-Pat Cool, Scotzudale, Ariz

For a system whereby musical lones ale from tunes such as Maxwell's Minuel of

-Scott Heigessen, Princeton, NJ

For the investigation of a "sock detector, that socks after one does his or her laundra - Michael Gracelone, Auburn, NY

For a solution of the Riemann hypothesis, which demands a proof that every is $\xi(x + y)$ must imply x = 3

This problem is tightly ittameshed with mathematics. It fits your feasibility oriterion since A Wol proved the (substantially

- Dave Joyner Decetur Ge

-Kerneth W Formet Nitch Caston, Ohio

For a device working on some principle no heaver then a parachute pack

For a process to heaze water all a temperal

For the first artest to do a landscape of be exposed to the water at that depth

-Marci amothe Temperatie N.

enated mechanical muscle

- Peter Binn Hollywood, Calif

that is absolutely useless and judged so by

- Phi Logay Chicago, II

For every to provide a sweether with unlim breakable atmosphere from the surround-

-Theodore S Watson Jr. Revford, NY

For the first person who can get every one of the cuestions not in the Onto Games

them off quard. You can't do that it you're

Takang their attedic ligense one step furpaid even less attention to the technical computer field to get a bunch of Ian nor to preserve the integrity of science When a character remarks, "Compuinstruction flagged possible resolution va telop directional quide application and substantiation," he does at samply to le We think as one flechnology is now a

Actually in this marter of science, Smart gets as much of his mellicacy from Adams. as he does from the script "Mechanically Deskrippile across a lawn and hit a hole The entire thing came apart. Well I didn't walk up to that shemiples and say Hold on and let me put this together liguet looked at ,

If The Mude Bomb is successful and if there are anough Adams grudonoly at he oups. The onlykinds of scripts light are tilled with pratials. The majule phybody door or talls down they say Bet Don Adams It doesn't do any good but I keep understand. I want to be a serious actor. I mand to star in protunes like Kramer vs Kramer I want to play a clope pugher a nal Or a scientist so I can have it all 1d about spaceships. Like Star Wars. Why should I at there watching two machines

Get away from Maxwell Smert? Adams the box officer, the action's after exporting dury to be a long, long stay And if Adams feels unexpy with that he s well aware of what -Sort Krahl Farfax Vs DO by Sory about that Chef DO

DREAMERS, HERETICS, GADFLIES, MAVERICKS, AND GENIUSES.

The story goes that Henry Ford once hired an efficiency expert to evaluate his company.

After a few weeks, the expert made his report. It was highly favorable except for one thing.

"It's that man down the hall," said the expert. "Every time I go by his office he's just sitting there with his feet on his desk. He's wasting your money."

"That man," replied Mr. Ford, "once had an idea that saved us millions of dollars. At the time, I believe his feet were planted right where they are now."

At IBM, we have 46 people like that, and we don't worry about where they put their feet either. They are the IBM Fellows.

They earned the title by having ideas that made a difference. Their job is to have more ideas like that, but under a very special condition.

It's called freedom.

Freedom from deadlines. Freedom from committees. Freedom from the usual limits of corporate approval.

For a term of at least 5 years, an IBM Fellow is free to pursue any advanced project of value to IBM, even if chances for success may seem remote.

As a result, some of the great innovations of our time have come from IBM Fellows.

We may not always understand what they're doing, much less how they do it. But we do know this:

The best way to inspire an IBM Fellow is to get out of the way.



By Dick Teres

farmers, and to talk about acticulture horses inactors and about nding interplandary sufficients Prough outer space. The Big Kalturia of space

Armstrong, the first man on the moon is conference held last summer to mark the tech annexies of the moon landing.

Armstrong showed up recently on the campus of Northern Hinois University in and Bob Woogon a university official

apparently a personal favor to him. But Lebaron Ohio reformed to himself as a that both the breadth and the details of our communities than they are in the big cities

I was born on a farm, as were my father and his father before him, he added "And understanding and appreciation of rak."

Or, evidently an appreciation of privacy

Bosides emphasizing the virtues of ferm Amationg CAR a block her in a large den

life. Arrest-ong taked a good cleal stouf a bind han malows den 1 and even about undertified living objects (he describes himself as a "UFO agrosse who number believes nor disbelieves! And yes he taked about creaty winds

Joseph Weber of the Litherasty of Maryland, who discovered that the wearts of a constant mass varies from time to woves nameping through the universe design spaceoralt to rice those previo power waves. He used spentists not to



manual anotalt and many knowledgeable

"My below belowed that the tractor fast boy from Ohio. "but things change."

And may the shuttle can There's an outside possibility that the Rureaans may launch a space stuffle belote our own Columbia goes up. According to a report from the National Space Institute component Analog Filipcheriko ca had the Soviet shuttle a "logical next stop Federates meshing in Munich, he paid, 11 -Americans to concratulate us such as we would contratulate them if they were first

denior that the Country with to large dolta winged, with winglets, and the repeateton is that it will be capable of atmosphere (unlike our own shuffle) Whet's more American spy satellites in effected from a Russian Tupolov To 95

What does our opvenment say about shut up Brian Sullivan, a designer for the Grace H Flandrau Planetarium in Tucaon Arrona while writers up some speculative partitings of the Soviet shuttle was asked by the Central Intelligence Kosmolyot had been drop-tested. Why would the CIA give a darra? Sultwari save the information woold give NASA budgets a shot in the arm suit the way Spotrik loci to the Apple program of the 1990s DO

SMART PHONE, BEEPING WATCHES

INNOVATIONS

anoune schwology pervados part about overy aspect of consumer electronics. Calculations stamon, objectors and over above have been imprograded with a sophispcated memory walkern. Now the triepporter as about to link up with the morphocessor. That belowed lifts table boot may become heauthnike their calculate

Listically a touch-inter expression. Instructional and the second sec

Another convenience of the Intelli Phone is the "busy chall feature If you reach a bisy signal or get no answer the phone well reckil that cumber automatically ance aminuation the neck you cim hear what a happening on the line; so you don't need to pick up until you hadr someone amount in other head

Chitoxi dating is a himdyfestureby real in flact and can be used independently of the "bury dati" feature Whenwer you mike is call with Hall Phone, whether you dat manually or 'uffee any of the abover sith in the crackle without hing hehandes you can her hephone being delind, reging, and berna answered

The clipping panel shows the phones keyboard servers several purposes. While during you can see the number displayed so that you know whether you're made an error. When you in not clipping the made display operation is a cliphing with the people of the hook. And if here should be a power fails whet will the



Livversa's computerated inicial Phase Compliately submittic, if can even tell the time

chipilay will read HELLO when the power comes back on to notify you that the clock should be read?

Up to temphone numbers can be stored in the phone is memory and recalled for automatic dating by positing a lambon law and than the number of the memory in which you have stored 4. You can enter an additional number in another memory and have it dated automatically get by pressing the law marked related.

Intell-Phone is a fasture lader package and scene reasonably proof at 5199 85 Our only objection to parkness promusting table of major new telephone technology and its probably only a malter to these bases more as available for less

We used to be satisfied when a wrolwatch could give us a reasonable approximation of the outpetitime. It if chich I run more than five moutes field or cultuments we put on our whole en so feature laden they can hardly be called watches. A leader in this trend is Dazen Wetch Company of America, and an called a watch in Others's Querts Multi-Alarm Mamo Chine/Repeater Or beeps For instance, a sequence of 11 1115 The unit also contains two 24 hour elerms that can be set to differen Irres, and you can distribute the slarma d flevent chirp, bip, and beep pattern in countidown to the will a rance of 11 hours 50 marcitles, and 50 seconds, its constantly changing face contains an alarm monitor month day/dain hour minute second. seconds per month DO

UP, UP, AND AWAY

EXPLOR/ATIONS

By Kurt R Stehling

Py not take an aenal voyage looke hims in 1984? Of well, to a champage public in 1802? See the stry bub Brande and the gittering spresend reaces splandes of Vienna by are on a ping mon in 1802? Wrethous only contartic tartasee of the conterprovement and strategies of the conterprovement and activity of the splant of the splant and Schuber?

Not at all No scores had the Age of Aer Travel bogun at the end of the eighteenth ombury there enterprising "Jannauds" soloted passegents to stobered balloon pumers for taken valie failable and gardfernen to be soon howing encougher doubt Nee Hereak south ballows For informating pasteries of the European gardry Today when what Solveign of

domaincy, the analocitic sport is again coming back no vogue. Where these were only a lew U.S. balloon clubs in the aaly Souther shee are now docens. Sporting events such as lead year's Abuquancue (New Mosco) International Balloon Reals artisct mary fundredisct part oparts and draw thousands of spectrops. Across the country pacing are rediscovering the typone pleasures of outsing with the wind—down valleys and over hits, turns, longets, downs, which of troos, yean glasses — to see the sky and the earth in hoos never visible from an altriane.

Actious the halos line as will all dependent sociality, lectrological advances halo model: more sposeling, chickly the respect our officie all for fill strongly, hot aris what got the first balloon off the gound on half halosic day NearMark 21. TTBL, in Plans Buthission advances though comeas no suprove for the relation of sport has been as calculated exchanting velows, greens, and purples – boday altimus thing and not yottee – bodays anotance motionan on their blooms

The first eight-kilomater aerail journey user, with D Adandos and Pallete de Rozer si pites "west made in a Montgolfar hor-are balloon. Its heated ar west kieled by bourney brendly-readed tags and some straw, plich, and wax. Marie Antonatin, automesso of the hispon captert, instead on using brandy raps, instead of sthking busing holes, have do, or so the contemporary account has it. That her royel schnozz cosid be so easily offended is herd to imagine, considering a change of underwear and a bath in those days were once-e-seen fields.

By the late 1780s, befooting was really catching on in Europe, especially in Its. birtholiace, France Hydropen-buoyed kinger journeys, such as the first English Channel crossing in 1785 Hydrogen relieved on the the lift of comparably sured hot-air balloons and thus greater range endurance, and payload capacity Not that hydrogen ballooning was easy or simple The pas was psimuly generated at the isunch site by chempels, including nash suffunctional Control of this land of balloon was more complicated than was the case with hot-are Saris pars, and other steering devices were fullie because the balloon would inevitably head in whatever cirection the wind happened to be blowing. Venting gas out of a topeade valve all the apronaut could do to achieve down-up control. A clever piot would sport learn to take advantage of valous wind vectors for some measure of lateral, or cross-country control Hydrogen from the absence of powerlines and crozettes. and by avaidance of lightning, was no big decades of ballooning more Montpoliters than Charkers (hydrogen-gas balloons)

No snoping biresurative were actured to hennore arrownak with regulations in the halopon years of the inteleenth centry. No barbed-ware (ence kickled to lear the trausiens, ak/ts, aid bars of ultimite balan raws of balconsist elischie power (hither—centre allowed and elischie power (hither—centre allowed and elischie power) (hither) (hither allowed and elistic hendre allowed and films)

Most balloon sto have learned to avoid these obstacks. Those who haven't are ford memories.



Bulcoving overs its popular resurgence to lightweight synthetic lubrics that are flams-resistant

115 CNIN

Some Americans go through life without discovering Bombay.

Pity

rding to many discerning atin

tion - herse your most drivis



drocen was available in steel flasks that reclaced on-rate manufacture. But after the in the Linded States, around Akton/Cleve-

Mino sand back and infailor you're fnely up in every And its gionous-in caim weather You rise as gettily and an curry as a feather We-made four of

mecaphone many balloonsts carry we used to sermonice from "on high 10 drawe looked upward

pletely noteviles. Does barking par horrs tie snuffling in their metal teeders at night

Alas, the herday of pas ballooning is iconing was forbeiden in most areas by

The astoniahing growth of honor baltoon no in the past 20 years is largely due to the malability of cheap synthesis labors. which are both lightweight and fame much herever hydrogen das envelopes. And which is the hol-en fail? Nothing

metal containers. While not exactly a post

Het art enthusaests in the Seties devolburner's nose amplified 1 000 times

The only time you expenses blastyl powening, if your ears aren't still ringing difference between the ar tomperature in hol-airs work best in writer when the atmosphere is colder. That is why several many places like Minneapolis/St. Paul

they naturally fly their own members first If not you can phone or write a nearby trai organization to contact is the National Washington DC 20005 or call 202.347.

There are several U.S. balloon expursion

If any even on the size to be a dilot and to own a hot-air you must pass a flying test concerned to shall out about \$5,000 for a

Don't think that you are than ready to precautions, its a fairly sale vertage with many a thril-and somethies spil-in your balloon to bring you and the equip you ever were in the balloon DO

Sun R. Switing is the plot in the movie To Fig



Apart from animal communication, the identification of the story angum raises questions about oreating genuinely intelligard contractes. If we can program compliers to recognize and naspard to the engram might likely not then became true timiling entativa?

Right now such a development is impossible. There isn't any computer today that could be programmed in this way dut as technology advances, who knows what may become possible?

On a more immediably practical level, the importance of telling stores has opened up rew aseruse in education My own realization of the story's role informan development, for instance, came about through studying the educational impactor Story's ling on developmentaly or parces have handwarmed children.

Like most peychologists I had left dones to the story eatims. Long realized the moretained of the story form when some sevening mitabled pastering (LG in the 78s or 78s) in y lab were suddenly able to gain reading comprehension because they were first shorise, instand of a dispatch genes of facts.

What made these accomplishments so astorishing easi that patients with an LO of 20 here only the bareat inking of language knowing fewer words that the score aces do That these low-I G patients could andenstand stores implies that story cohesion is so basic that it survives severe neurological damage

The importance of somes to learning became wave more evident through our only too fallwards—ware patients were ware to elde to fallware stronge because of part mail exclusion facts and pauseware fairly good souther facts and pauseware fairly good souther facts and pauseware fairly could fit marks stores out of what was going on three.

This pair intimoted me of source schucephrenc patients I had seen with assuge 12 s but with an after rability to impose a structure on neally to set a conversit story such a patient con function only line a computer his knowledge banks are intool. but his campool fails line altout the world

A third petert Hall demonstrate the story's microtimore in a different way Hol could always follow a story and he would tell his own outrageous talles, but he suflevel from a type of particle control blinchess blut enclaved him integrable of necommon the eightabet

bein when lettes were prospected sold by side helvald difficulty dasingustring between them (A computer that could heve destuid its information units could never comprehend a massage but from them) We wanted to know whother the human brain could comprehend a message (story) even if it couldn't tell the units. Outtant) apart: Could the story contact makes the brain draw conclusions about letters that it couldn't differentiate? He's brain could indeed accomplete this actionshing test, a starting demonstration of the enbiatenetic cover of abores

Advertisers have long known that stories are the most natural means to influence people. We assemiliate microsation before through stories than through any other ions of communication.

And yet this lectringse has been graved by many teachers, even though it is advacus that, current educatorial methloading that is a strateging autorith travel lack and paging their matchion with I O style teacing - completely matching autorith travel metals a bay evalues advantad person lacks at generates like Oracehri and Entises at generates like Oracehri and Entern that judged only the networks of facts in the used accentrations of facts.

The brillance of bese men sterrmed from an ability to enace sched that made sense out of the workt Emploins theory of wishing spanned the universe Churchil tumod Work War II into a competing national drame that held the British people together under incredible strains

If we recognize the engigermuc nature of stones and mold our learning systems upon this natural model well find we learn far taster and more enceptibly Who knows what stones well be as to test?



GAMES

PHYSICS PUZZLES

1 Antis Weik 179 inches per second

2 Overhand Yes In fact, the top domini can be made to extend as far as you want ping the structure. As shown, the top The second projects %, the third Ve the fourth %, and so on After five dominoes ans placed the top coming. A is siready cligat



by more than its own length over the fifth domino. With an unlimited supply of dominoes the offset is the imit of 12 + 14 1 crow as large as any trate number. The prowth is slow however Alter the tribate an interesting experience to try the overband trick on 52 playing parties. If you have ramble singers you can build an overhand that exceeds two card lengths

above you. Ther mass culls you up and so below your feet that pulls you down

up-and-down movement of your blood's center of gravity as your heart goes through its pumping cycle. For a person ereighting 165 pounds (74.8 kg) there is a

5. Bulloon Pushed under the surface. the farther, the density of the balloon plus weight continues to increase and it seles oven laster At great depths in the power water censulty is no hoch that the balloon

40 kilometers per hour not 45 kph You ien Hill were 60 kilometers high you took two hours up and one hour down. A 120 km

7 Iron Doughout As the doughout exthe hole also gets bigger This same principle is at early eiten an opticion minouw, a metal kd on a stubborn as heat the kd under hot water The lid mer orgumleeggiy loosen 6

8. Step on it: Speedy will have to drive at an infinite speed in order to average 100 igh for the course. He must drive the speed, but he has already used up his tersceed faster than light

attract each other if weller is removed from one spot in all space (bubble A), the prevtational balance surrounding II is upset and the net effect on a nearby inclocule of mass i.e. cutward, away from the butche If there are two bubCies, the water between

10 The Pissing Bucket. The speed of the water depends on the depth below the water's surface which is the same for both outlitts Water will come out of both holes at groof, however imagine that the two cullens



were on the same side of the bucket and pined, as shown above. If water flowed faster through ether opening, it would overwhelm the water in the other opening

11 Magnet Rot Touch the end of one bar to the middle of the other it there is mapnetic straction, the touching and must be

12 Batteship in the Battaub. As long as there is enough weller to surround the ball liesho completely it will fost The boets. hull 'doppi't know" whether if a sur prossure on the batteship's hull a the same in either case

13 Perfect Tune. To get a plano in particid turne would take iterativ torsver The tuner sounds the piero and fork together and laters for beets As the plann string is the beats might be more than a minute apart But the sound of the petro string dies out after a minute or so, at most So we I have to accept the fact that even the towst Stemativ can never be quite per-

14 Twitching dats The bolt heads will remain at the same distance from each other stationary

15 Something for Nothing Yes, there is a output then the amount of joules in electric energy input required to run if. The device is the common air conditioner in summer facing out the window the air conditioner electricity to work is very poor air concitioner) it must expel 19 joules of heat around in the window With the same 10 side and expels 19 pules of heat on the warm ade which is now made. The backstreally get something for nothing? In a way ves. I dopptit make heat as a toaster dives but it moves beat By teelt heat pump (and energy to fun the pump) if con

heat. In the thin chattoache class heat surface of the glass and the glass expands with relative unformery When wor new het water unto the thick plass its mile surface expands guickly while its outer surcracks. That's why you can pour hot life? coffee rito a delicate wineclass. But don't the the same thing with a lumpler DO

Page 8, Pot 148 Frang Sightroniane page 42, Do



CONTINUED FROM MORE 20

ocited when we bund them in 1982 a new ingrement of the same save places in a name war on the same save places in a travel war on the same save place to they will kern not a straight into but an unstate occorrectification in a multipart of the planets, including upplace, tagging the planets, including upplace, tagging the planets, including upplace, tagging the planets of one accord, in 1986 that much are of the same period places in many signal of the same period places in the planets and places and places and of the same period places are placed and the same period places are achieved in particular.

What has changed my mmd7 the autophane relates to fit with our next estapolation of absumption have the fatter change and assumption have the fatter change to gate meet would narrow the change to gate one have in 1979 to carts active (increasing taxis), it now looks as if the pask of the patient cycle with these pasked before the relative patient of the set of the down the baseling a charter is not an advised.

Plagemann and I deletely got the year wong. On this evidence, there is every prospect that 1982 will be queter in see mo toms then 1979 and 1980.

However, as shypore with kingpup to disc on authories media kingpup to server, to be in the individe of a spetio disc on authories the state of the server individes the server model and the server shares and the server individes the server shares and the server individes the server shares and the server individes the server the server is a server in the server is and the server is a server in the server is and the server is a server is and server is a the server is a server is and the server the server is a server is a server is a the server is a server is a server is a low to be server is a server is a server because the server is a server is a server to server is a server is a server is a low to be server is a server is a server the server is a server is a server is a low these been investigations.

In retrospect some of the accusations that our book was alarmust seem patilied 1 am obler new and 1 hope water 1 would certainly not present the same material in the same way if the idea had just occurred to me.

There is an important leasen here, which may be when our according critical were trying to tall us. Dant open the door for hist-backed colls to latch an to your clease. The key words earthquake, planetary adjument, and 2882 were all that the werelas needed and all they ever keyer about the Junne where.

Don't believe anything you hear about "operfile" forecasts of doorn without seed ing the organic II anyone trees to wann you about the Apocalypse corring in 1962, just all him that the did theory has long since been dispectived

Mind you as long as the sun continues to be active this year. I'm keeping my fingers crossed for the select of a CO

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992-5710), or mail the coupon to McGraw-Hill Photography Welsonsin Avenue. N W. Washington, D C. stornt.

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exections TM are no more members of a is both situations involve buildings on

vertied program is halfond break(hyough m

The chese shot from your "hidden cart-

We do not depute the "personal payong increal hanging of TM and added some Anctions-hoertrale respiration getvanic skin menozew. Abnormal does risk meen

us. We're on the twentreth floor - Ed

While I certainly agree with Robert A. Hern len's beau partie in Sproff' March one comment in his article made ma intanaaly angry mothers at term must be clessed as Temporarily but severely hand I have engaged in numerous physical acrokey in my eighth month, hearing in the mexicitians within days below and after my few days before owne beth and milleno

By no strutch of the imagination can we detrees in babies, not to mension that we many not sump to conclusions about its safety as we did about X rays and DES like his are responsible for the antimother hood attructes that make second-class citizens out of so meny women and that

thourseds of blinded behaved and other

Free Exams for Test Subjects

I sent to mepond to Dava Sobel's arbolo

The American Others for Honesty in ton DC 20008) has initiated a nationwide Arsenal Marviand, from the cerly 1960e. lest a visety of mild-corbol drups inwho allegedly voluntarized to be a part of was a powerful hallucinogen reportedly ten times more powerful than LSD The drug was intended as a mental incapacitant The army tested BZ on 2,490 volunteens betawer 1960 Mid 1968

Oi from Cold

With seference to Douglas Colligan s article The Nap Papers" [Continuum October 19791 I would like to elaborate on what Gr

South Alrea has been interested in the oli-fram-coal process since 1927. South Alopments prior to and during World War II begati production in 1965. According to Mr. Colligan the German method is far smampler than the South Alncen method. based on the German model

As for "more productive." Seed I was not thenc fuel is produces a vanety of other netochemicals such as pipeline cas. by the chemical and plastics inclusives

Saso II, which will begin operation this war and Sazzi III, which will open in 1982 fortis such as greatine classed LP gas will use the Syntol process because of its higher weld of passoline and classic fael

Johanneshum South Aloca DC
SEEING DOUBLE

STARS

By Mark R. Chartrand Iii

where the second provided the second second

unusual. After all it is orbited by the only proven (intelligent?) life in the universe. It is also unusual because it is angle

Most stars have comparisons other stars obtiling them. More precisely, they all obtil a common center of many Such groups are called star systems, and more than 701200 are known.

The release start systems, including but own, her systems and have double and own, her systems and have double and another systems and have double and systems and another release the systems and another large systems and systems and another systems and systems and systems another systems another systems and systems another s the sun now making it the hearest star known Hence its name. Provina

"Durit the test state - companies cannot be best to statistical and the state and the state of the state insuch repetent the state are understated and the state of the state

Many size systems will have more than just have stars. There are systems of Erres four here, or more stars, ellin a oriesthal basis along there center all maps choreographed by the law of gearty. Out of 100 typical star systems, about 23 would have thise or more members with a basis of 81 stars, while 67 would be double



Gast proviseds of gas make costact bearies some of the most spectracular signa in the sky

and only 30 would be single

Which alisis diff each other closely enough the guidesized paid of the system delates the other. One or both stars may umple strate are. Alison star of the system again image research aligns, spexing masterial from the port the drop mogant primaliant alist gres sumscring the system. This has alist a run even exchange means if these contact barranes that way

Entry order in a white we discover a double-star system created so that the plaine of the stars, order is spen-odge on During most of the order. The left we neceware is the combined output of both stars. When only passes in force of the other we observe a sight dimming the amount dispensition on the effective curbace brightnasses of the level stars. These we be stars called exploring vanable stars.

Such assistment mervelops a drophysical laborationes for classes mergin sheller properties. By simply immig how long an inciper lists, we can find which the site of the stars relative to the area of twee calculated by using the task of gravity and motion. As a laborative class the dot the familiand measure of they size. These familiand measure of they size. These familiand measure of they are hard to deter otherwork that are hard to other otherwork that are hard to

Do stars have either stellar comparions or planets but hit both? Or can multiple stars have planets too?

The assistence are not yet income. Our calculations show that in multiple-take apatemic them occurs to some stable planetary order. It planets formed in some other regions around the stars indexed on the stable of the stars indexed planetary order in the stars indexed and a contraction to be an star

The space telescope an entring observatory to be launched by the space shuttle in the middle 1980s is going to look for stellar companions. Perhaps it will help answer these questions CO



Can we know our past lives?

Does personality survive doub? Doexperieous of past lows cling to our conscionnees—as the secent of a Hower Impers on? There are mistakes you could do diferently—if you could do diferently—if you could be certion. Have you felt strangsly unkle yourself—more like somone else—with different inclinations and personality? Do new places and forces seem familiar?

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New
Address.
Cit
Gata Mg

EARTH

spreads. I feit miniaturated, or transported back to the Pleistocene: an age when evendance was coetsize.

Twentie wagtes in one spot, seemed a horde in had, southeast Assia seet eegiss in the geneter confergutions. These is a wave-mile straich of the Childer River that aach write stratics 3000 to 4,000 biddreegiss in November contains to and 60 to a trait. The registry control become too character have of one king after other ment are tracema at warg the brids to food on speared out gathors will the write write are tracema to be provided to write the write

This gothering of explain, the briggist convention of rapics in the world, is now headered. The state of Assisk has entend reto a timber cale contract with the Schwabel Lumber Company of Hames Assis. The contract permits heavy loggrag in the Chikat Waley for the ninit 15 to 25 years.

The scale powerment of Aslaka news terms to heater of this to potent is with demasks has entered into this agroement boths the answered into this agroement boths when they are also the register. Comand the scale of the scale of the scale in October and November? Where do they also when they leaved hear models agreeped agrowthe the Scale of the scale of the scale of the or they work? Hear models are postion of the work? Hear models are posttion of the work? Hear models are clearly agrowthe location of the scale of the Aslas topoles (on the hard) test test of the Aslas topoles (on the hard) test test of the Aslas topoles (on the hard) test test of the Aslas topoles (on the hard) test test of the Aslas

The efforts and the large gas name can be then one of the large the large set of the set of the large the large set of the set of the large the large set of the set of the large set of the large set of the large set of the large set of the call large and large set of the large set of call large and large set of the set of the large set of the set of the large set of large

The isagecy is that many of the statdards by which the magnity of the earth crude be judged have bein out down John Hay has writen if that isagety ortions to bab's region, we will have proved Bay Frankin right The tarkey will be our surbul after at 200



MAYEO

OMMI, the magazine of fomorrow, means back issues abad of behind the times. Limited supplies of the abad of behind the times. United supplies of the abad supplies of the abad supplies of the robust supplies of the near supplies of the means and supplies of abad mining the abad supplies of the of the of the supplies the supplis the supplies the supplies the supplies th

We'll rush you the magazines of tomorrow that were on sale vesterday.





PHENOMENA

Eichy moting des ji cickés a unique verinvestiones in the line Plazachard investiones in the line Plazachard Construction of construction of the construction of construction of the service advectories of the provincial discrete function of the provincial discrete function of the plazachard discrete function of the discrete discrete discrete function of the discrete d Physics 101: Barometers, balloons, bubbles, and a battleship in a bathtub

GAMES

By Scot Morns

In learning the sciences, examples are of more use then precepts _____Sy leave Newtre

This month's puzzles require an elementary understantiang of physics. No complexitual mathematics are needed only an intudive grapp of how things work in the work!

Instrempy the unerthodas thrining of the soluciant in the becometer stray (betwee from my book The Book of Stanaya Factor and Lakakas (Skimaton, Doubled by) Dolphin 1979). Then thy your trend at some science-sometisal pozialise. Some of them are usitapted iron Tricking Physics by Lews C. Explant and Pask of Hewit (height Press: 1979), and Science them Assess: Practicular, and Followise, by Christopher P. Jaspool (Charles Scrittory i Science, 1976).

THE BAROMETER STORY

Areander Colender, profession of physical accuracy at Wathington Daverging 26. Low of United States and the second states and the second states subset in a state states and the second states subset of a state building with the second second subset of a state building with the second second subset of a state building with the second second subset of a state building with the second second subset of a state building with the second second building and the second second second second subset of the second second second second subset of the second sec

The teacher wanted to score this tinseet zero baceuse it showed no knowledge of physics, but the student thought he deserved fail credit for answering the question connectly.

Celendre decided to give the student another by, so minutes in which to write an alternative answer their would displike some understativing of physics

In a subart set over a solar peece or paper for the minutes. Calencia assumed he would fail the exam four the final menute the student desired off the following. "Skin the balance and the log of the building ancient over the edge of the 16. DMM root Drop the barometer timing its fall will a stopwatch. Using the formulais = 16 etc. colouisto the breats of the bailding

The assume visit particulty called in the proposal of called any particulty called in the assume of a large of called any called any mesone of a large of the visite the aspected mesone of a large of the visite the aspected mesone of the second of the second mesone of the second the second the second mesone and the second the second the second to choose the beside of the large of the second on a same of the second the second second the large in the same and the second the large in the same and the large of the second the large in the same of the second the second the large in the same of the second the second the large in the same of the second the second the large in the same of the second t

Fine Celandra said Any others?"

"You could take the backstear in hand backstear lands making by go go backstear lands to a stranger of the backstear lands to a stranger backstear of backstear backstear of a stranger series a stranger backstear back and a stranger web of the backstear is promobile you could calculate the head hand at the back and the backstear is promobile you could calculate the head not be backling from the difference backstear back and walks of a pro-

There are need cost cost on the student added. Phobably the best is to take the barcester to the beaument and knock on the superintendent's door When he answers, say, Mr. Superintendent's here a wery line barcentar here, and i will give it to you if you will fell me the hereful or the building.

PHYSICS PUZZLES

 APTES WALK: A subway train is approaching: Times Squares at 144 inches base second logo). A manimore subway care waveleng trained in the cut of SP(ps) sature to bas solate. He is eating a logo-hang had dow, which is entering his mouth at low inches part second. All rait or the het dog is normally sate your the manim mouth is one inch persecond. How fasts they are superviseding. Times Square?

 CVERHANG Dominion she stacked ac Insteach domino projects as far as possible over the domito balow without failing. The geatest offset is obtained when the center of gravity of the top domino (A) is deputy above the and of the therein (way (B) and the combined.



canter of gravity of these two dominates in denotiva stoces the edge of the fitted domina (C). By contraung this procedure is to possible to stack dominates at that the top domino progects more than its own length begind the bottom domino? How many dominates will be explained to be this?

 INNER SPACE: Down in a coal many below the surface of the earth is this a more gravity or less gravity than there is act the entrance to the mane up at the earth's surface?

4 WEIGH IN: Even if you stand perfectly still on an accurate scale the making keeps coolising around your average weight. Why?

5 BALLOON An ar filled balloon sheld underwalter by a weight so that is suit on the verge of unleng the top surface of the balace suit fourthes the whort in: E voi.



pugh the balaxies beneath the surface of the water (as shown), whet will it do --bob back to the surface, remain all the lovel to which is pughed, or any to the bottom? 6 MOTOPISIKE THIP Suppose that you motorbike from Bowd's Beach to the top of Hearleen Hill and then return. You average 30 kilomatans per hour for the top up and 60 kph on the way down. What is your service sevend for the reund tro? holes of equal area through which water is discharged. It can flow out through hole B at the bottom or through the downsport which becars at the too. It and here to

 IRON DOUGHNUT A piece of sold iron in the shape of a coughruit is heated over



a line. As the iron expands, does the hold become larger or smaller, or does it remain the same size?

8 STEP ON IT The Base road race is 1000 islometerslong. At the halfway point Spreety Grouples calculates that has been driving at an evenage of 50 kph. How tast should be drive the second hail of the road longer an overall evenge of 100 kph?

9 DROPS AND BUBBLES If all space were empty except for two masses close together, say two drops of weldy. The drops would be attracted together according to



Newton's Law of Greety Now suppose all space were full of water societ for two bubbles. How would the bubbles mow? Apart? Toward eschlother? Or not at all?

10. This PRSING BUCKET That site nome private this prazely by Epidem and Hewitt They say 4 is "a backle quasiant of notes hydrolegad George S. Plasing and is sail often asked of graduate students during and exeminations."

Consider a blacket of water with two



opening the same distance below the witer surface as hole B. Ignoing any friction effects out of which opening will the water flow faster and why?

11. MARKET TEST You are in a locked form within 6 defined in the basis. One say bar magnet the other ion it magnetized the docknote and has lock are media of brass (not magnetically active) and there your patient line room, not occer an your patient line in the room not occer and your patient. How call you just which have it magnet? You could augure all which have observe which has finds to part north its here a sempler wa?

12 BATTLESHIP IN THE BATHTUB Can you foot a battleship in a battleship Spool cavit, the battleship balow at left. footing on the high assar, weights 30 000 tons. Imagine the ship slowly ownead with a hugh battles shaped like the ship but a



It is legar and containing a small volume of woor As the stops is tweeter the vester is forcad up the sides of the tais that there is only it this entry's hour is at possible to the tab and the strip's hour is in possible to frost in 30 000 too battlesting in sevenal hydraid batters of weeter? 14 TWIDDLING BOUTS Below are two identical bolts held together with their Unsadaut street, While helding bolt &



stationary you swing boll 8 eround it (Don field the bolls turn in your lingers.) Will the bolk heads get nearer move farther apart, or fernien at the same distance from each other?

15. SOMETHING FOR NOTHING Type partition joules of electrical energy into an electric heater ten joules of heat will come but its them any device from which you can get more than ten joules of heat with entry for inseles of electrical incur?

16 CRACKED UP Pour hot water into a thick climiting glass and into a thin



champagne glass. Which glass is more likely to creck? CO Answers on bace 120

SAVE THE TOADI

LAST WORD

By Norman Spinrad

he past decade has server a public, a new understanding that the multimilion-cioliar dam humans risk then

days of eccentralitanment a species of

the east coast of Florida, not far from the

A major selimo point for the Valhalia were completed it was descovered that what way to proorne the exchaer th and overgrown with rolling paim frees - wild species the giant flying varione load

spears of too - a huge wet bit preen

The part living verges told a the only ting with west's Two of them. Upper front sharp as hypodermic meetles and holiow

emphicial) seems marked for extinction 100 (80%)

When it was discovered that the Valhalia Development Unimted sagred a consent order with the EPA to receipen the eichtearth hole to incorporate and preserve its habitat as a swamp hazard

wind that day and many ophers were

down in the logs of trees, currently occural some as-yet-unelucidated heat

The crafty creature waits until the Therut releases its gtip extends its enings and silently acome in on its prey extended it pierces the back of the nack plasters its shrew stoky body in the prey a har grabs on to the ears with its claved and bands there upside down throbbing long hollow tooth

awarno hazard of the eighteenth ficks their neck with two-inone

Pastoction Agency in order to demoksh the succession pointing out that it would

other scientifically unique species of women such as the cockroach, the rat

Faced with a dead loss on the now-sneelable Valhalia devalcoment coveniment for damages. Just as this concectional wetting case segmed destrated weifam sectorerts, who, if was pointed out

development was occupied by nongoting welfare recroients and the geant fiving

population of grant flying vampire toads welfare condos has driven away the provispecies has once more driven the

Only an aroused public can now prevent a hideous act of genocide-by-neglect. It a one thing to size locily where and cure ecological awareness summon the ocurace to rafiv behind a clarit. Fying blood-sucking frog? Where do we humanspressume to craw the line? The paint fixing vampina tood is the ultimate acid test of

doctor of course The titling amount of compared to the banefits they would gain

the gaard faying warrante toad i DO