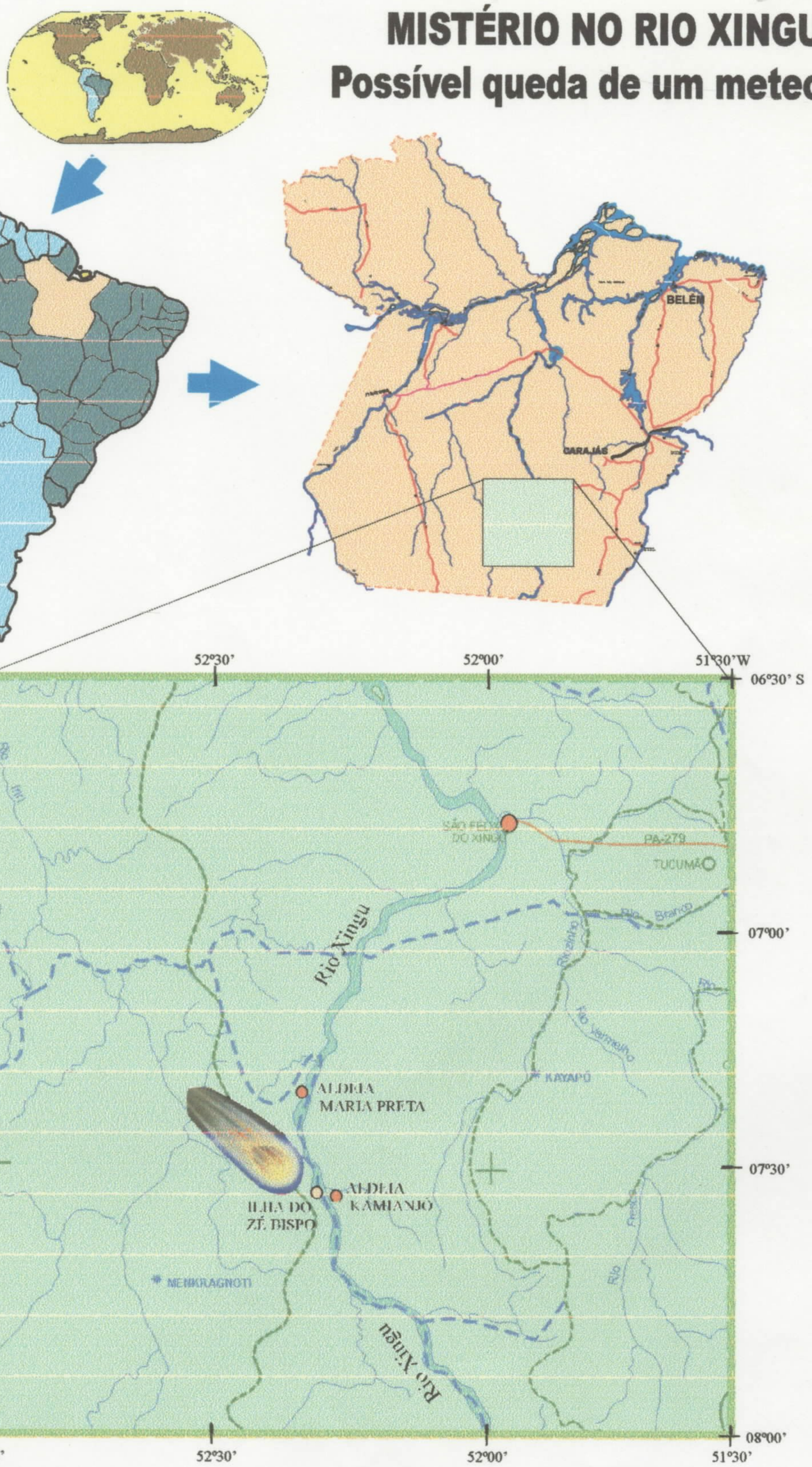
CPRM
Serviço Geológico do Brasil

MISTÉRIO NO RIO XINGU
Possível queda de um meteorito?



BELÉM
Outubro / 1 9 9 9

MISTÉRIO NO ALTO XINGU – Um possível fenômeno meteorítico?

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CONSIDERAÇÕES INICIAIS

O jornal O DIÁRIO DO PARÁ, do dia 19.10.99 (anexo), estampou na 1ª página a seguinte manchete***: OVNI ou bomba em São Félix?*** A reportagem abordava a queda de um objeto não-identificado, no município de São Félix do Xingu, que teria aberto uma clareira com mais de um quilômetro de extensão. ***"Mistério no coração do Xingu,"*** apontava outra manchete nesse mesmo jornal. Tal acontecimento, também divulgado pelas emissoras de rádio e televisão da Rede Brasil Amazônia - RBA, ganhou repercussão nacional, pela Rede Band, e até internacional, pela CNN.

Considerada a possibilidade de tratar-se da queda de um meteorito, a RBA, encampando uma visão de jornalismo científico, contactou o Centro de Geociências da Universidade Federal do Pará (CG), convidando um geólogo daquela instituição para acompanhar a equipe de reportagem. A Direção do CG, por sugestão do Profº Rômulo Angélica, propôs à RBA incluir o Serviço Geológico do Brasil na incursão, redundando na participação, também, do geólogo Nélio G. A. da Mata Rezende.

OBJETIVOS DESTE RELATÓRIO

Parte 1

Descrever, de forma sintética, os diversos efeitos decorrentes da queda de um meteorito, bem como abordar as características genéricas desses corpos extraterrestres.

Parte 2

Descrever as ações desenvolvidas no sentido de desvendar o acontecimento na região do rio Xingu.

LUZES NO ORIENTE
A chuva dos meteoros leonídeos (partículas liberadas pelo cometa Tempel - Tuttle) iluminou o céu dos países do Oriente Médio na madrugada da Quinta - feira 18. O fenômeno acontece quando a Terra cruza o trajeto de um cometa. As partículas entram na atmosfera e se tornam incandescentes, causando a chuva de meteoros.

FONTE: Revista ISTO É, nº 1573 - 24 de novembro de 1999.

MISTÉRIO NO ALTO XINGU
Um possível fenômeno meteorítico?

P A R T E 1

(Generalidades sobre os meteoritos)

METEORITOS

ALGUNS CONCEITOS

Meteorito: Corpo que, procedente do espaço, sobrevive sua passagem na atmosfera e se precipita sobre a Terra.

Meteoróide: O meteorito, enquanto ainda no espaço externo.

Meteoro: O meteoróide, quando se torna incandescente ao atravessar a atmosfera terrestre. Estrela cadente. Qualquer fenômeno atmosférico (chuva, vento, arco-íris, raio...).

Astroblemas: São estruturas sugestivas de terem sua origem causadas por impacto, como crateras de bordas elevadas e centros lenticulares, brechados. Em torno dessas estruturas é freqüente a presença de quartzo de alta pressão (ou seus polimorfos) e sílica fundida. Em todos os casos, o corpo impactante foi completamente vaporizado ou os remanescentes do meteorito foram destruído pelo intemperismo. Exemplos de astroblemas, incluindo no Brasil, são mostrados nas **fotos 1,2 e 3**.

Finds (*encontrados*): Meteoritos coletados, mas cuja queda não foi testemunhada.

Falls (*caídos*): Meteoritos coletados após terem sido visto cair.

Classificação

À medida que evolui o conhecimento sobre meteoritos, os esquemas de classificação sofrem alterações. Os principais aspectos considerados são mineralogia, estrutura, quimismo e, até mesmo, conteúdo isotópico.

Os meteoritos consistem essencialmente de uma liga ferro-níquel, de silicatos cristalinos (principalmente olivina e piroxênio) ou de uma mistura desse constituinte. Corpos vítreos, chamados *tecktitos,* podem também ser meteoritos.

Sinteticamente eles podem ser agrupados da seguinte forma:

- Sideritos ou *irons* (média 98% metal)
- Siderolitos, assinderitos ou *stony irons* (média 50% metal, 50% silicatos)
- Aerólitos ou *stones* (Condritos e Acondritos)
- Tektitos (vidro rica em sílica; ≅75% SiO_2)

Os aerólitos, de acordo com sua textura, são divididos em condritos e acondritos. A designação *condrito* é devida à presença de pequenas esferas (≅1mm de diâmetro) constituídas de olivina e/ou piroxênio, chamadas *chondrules* ou *chondri*, e que nunca foram registradas em rochas terrestres (**foto 4**). Os *condritos carbonosos* compreendem um grupo importantíssimo de meteoritos. São considerados os mais primitivos e fornecem subsídios sobre a própria origem da vida.

A maioria dos "***finds***" são sideritos porque estes exibem as características que, em geral, se espera dos meteoritos: que sejam pesados e escuros (ferro). O tipo ***stony***, embora

Foto 1
Enlargement of a Landsat satellite photo showing the 24 - mile - diameter Araguainha Dome in Brazil. - NASA

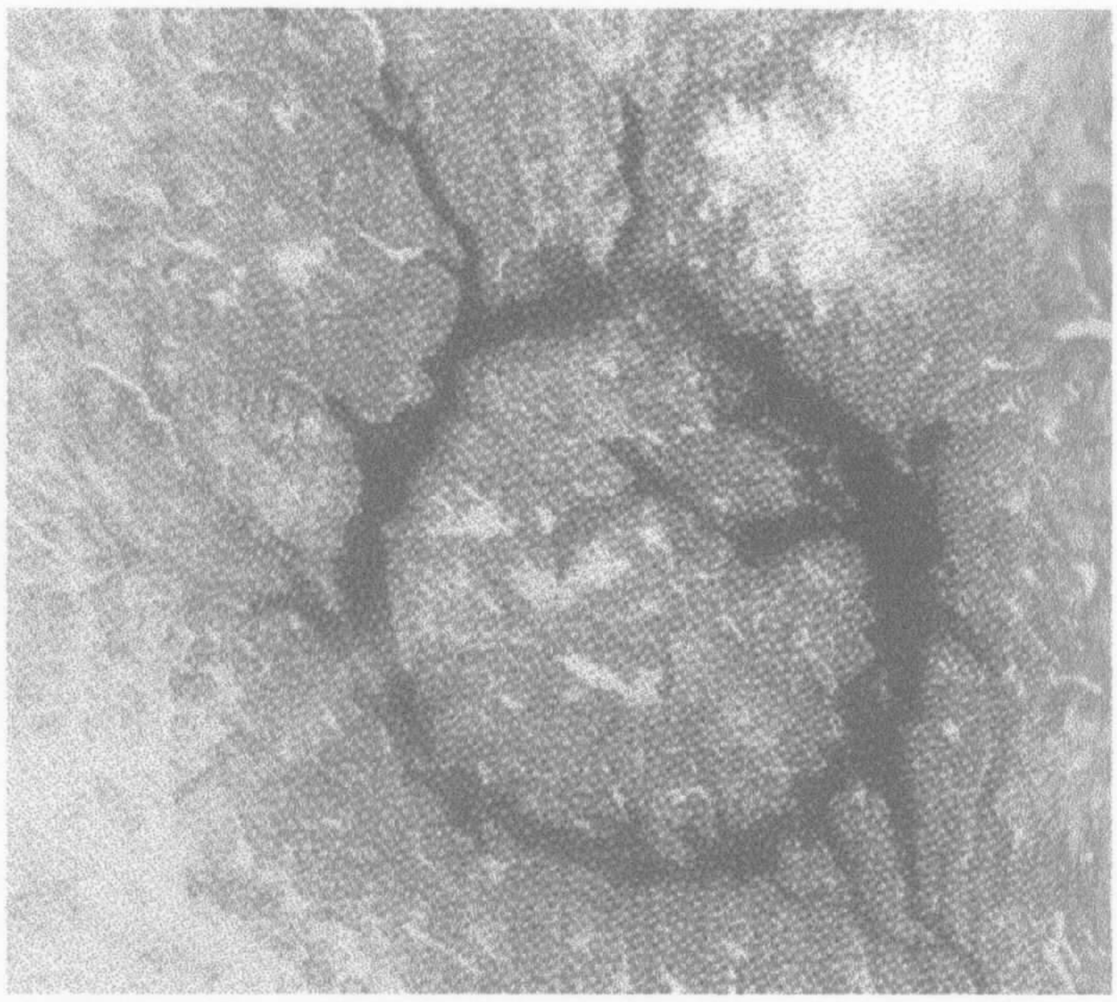

Foto 2
Wolf Creek Crater in Western Australia. (The crater measures 2,800 feet across and 160 feet deep.) - Smithsonian

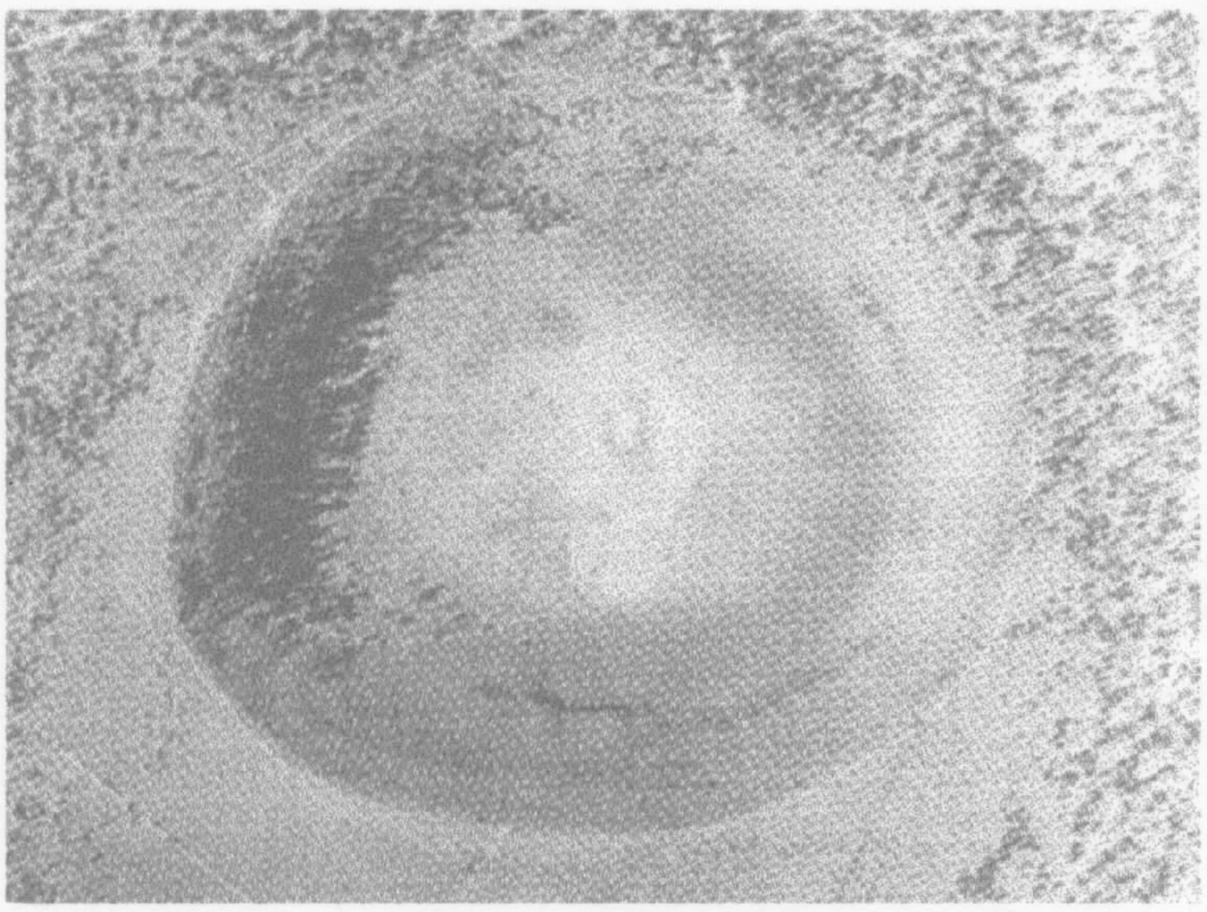

Foto 3
Hole in the Ground, a classic steam-explosion crater located in central Oregon's high-desert volcanic plains. The crater is nearly the same size as Meteor Crater.
- Courtesy of USDA Forest Service.

mais abundante, assemelha-se com rochas comuns da Terra, pelo que são mais dificilmente percebidos.

O **quadro 1** mostra uma comparação sintética da mineralogia da crosta terrestre e dos meteoritos.

Importância

À exceção das amostras de rochas coletadas na Lua, pelas missões Apollo (USA) e Lunik (URSS), os meteoritos são ainda os únicos materiais tangíveis a oferecer subsídios sobre a formação e evolução de outros pontos do universo.

Meteoritos são mensageiros dos primórdios do sistema solar. A idade média varia em torno de 4.500 Ma, cerca de 1.000 Ma mais velha que os mais antigos registros da Terra. Esse hiato deve representar o estágio de evolução de uma crosta estável neste planeta.

Como reconhecer um meteorito no campo

A maior parte dos meteoritos é encontrada por curiosos à procura de rochas *interessantes*. Em geral, as únicas características que chamam atenção desses coletores são a cor (preta) e o peso (em geral são mais densos que as rochas terrestres). Entretanto, a maioria dos meteoritos é do tipo *stones* e, superficialmente, assemelham-se a rochas da Terra.

Os meteoritos, no campo, têm uma aparência distinta, que contrasta com as rochas adjacentes. Além da aparência externa, é importante observar características mesoscópicas, após eliminar eventuais crostas de alteração pelo intemperismo. Lentes de aumento são ferramentas básicas nessa análise. Um imã também é importante.

Forma: A forma original de um meteorito geralmente é modificada durante sua passagem na atmosfera, adquirindo bordas arredondadas e formato algo esférico ou elíptico (**foto 5**)

Dependendo de sua forma original, o meteorito pode adquirir um formato cônico, desenvolvido pelo processo de ablação (perda de massa), no atrito atmosférico, em função do movimento de rotação em torno do seu eixo, orientado na direção do movimento (**foto 6**)

O *pitting* é outra feição característica, mais comum nos *irons* que nos *stones.* São pequenas cavidades provavelmente produzidas pela ablação diferencial sobre minerais de baixo pontos de fusão, como a troilita.

Crosta de fusão: O calor do atrito provoca fusão superficial e formação de uma fina (poucos milímetros) crosta, usualmente de cor preta (**foto 7**) Nos meteoritos tipos *stones* essa crosta tem aspecto vítreo.

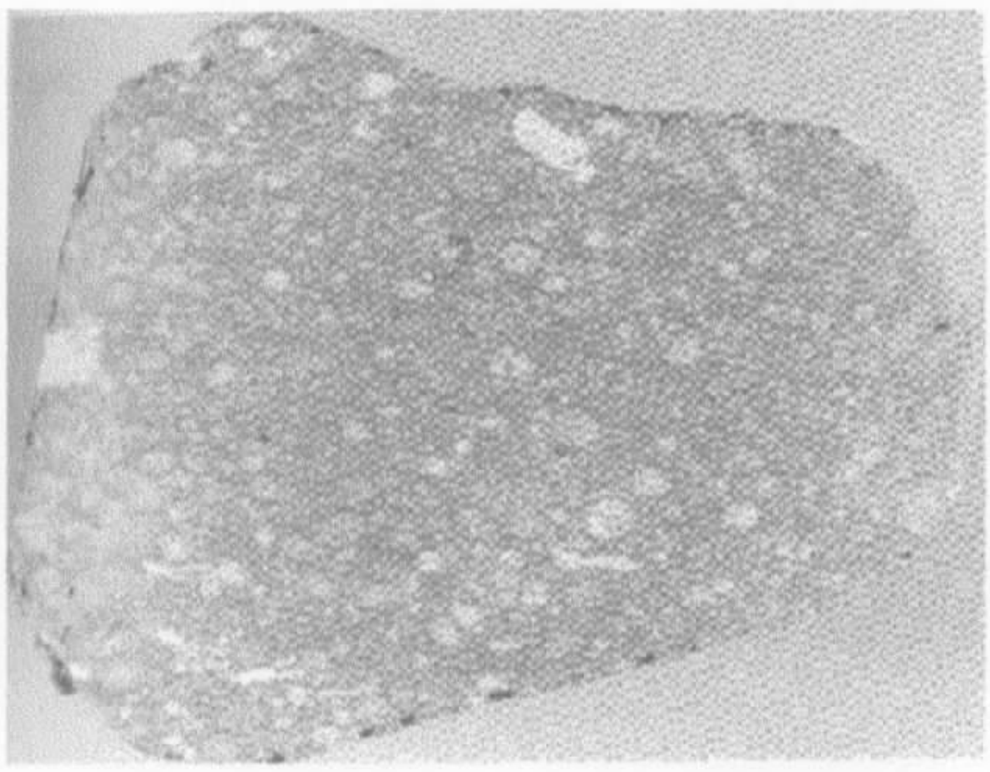

Foto 4
Cut face of an Allend meteorite shows densely packed round chondrules se t in a gray matrix. Irregular white inclusion are scattered randomly through the meteorite. Specimen measures almost 2.5 inches in its longest dimension.

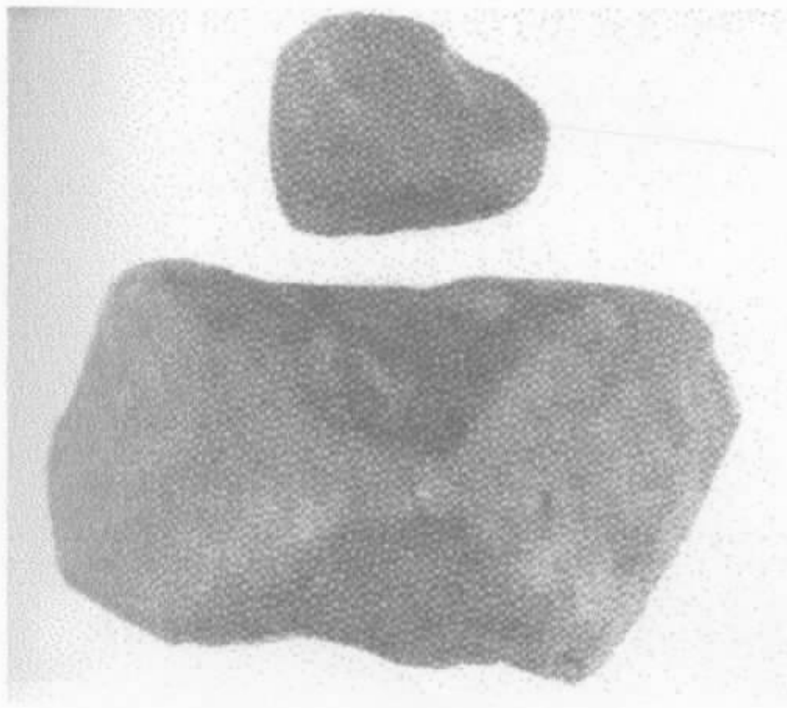

Foto 5
Two Plainview, Texas, stony meteorites. The larger specimen is elliptical, weighs 7 pounds, and measures 9.5 inches in its longest dimension. The smaller specimen is more rounded, weighs 1.5 pounds, and is 3.5 inches across.

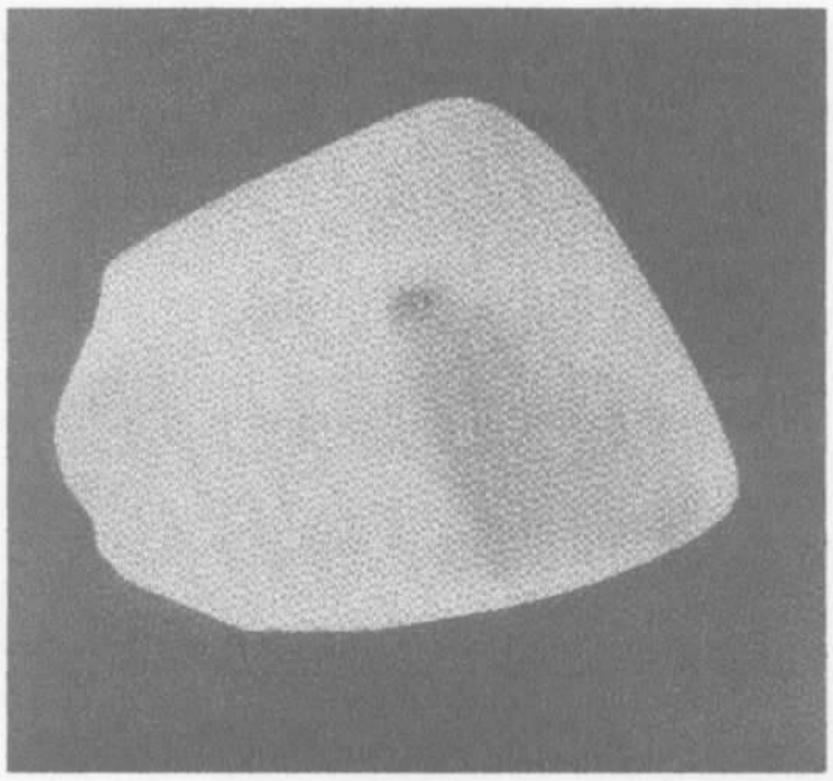

Foto 6
Beautiful oriented meteorite from Plantersville, Texas. This stone, which weighs 4.6 pounds, fell in 1930. - Smithsonian Institution

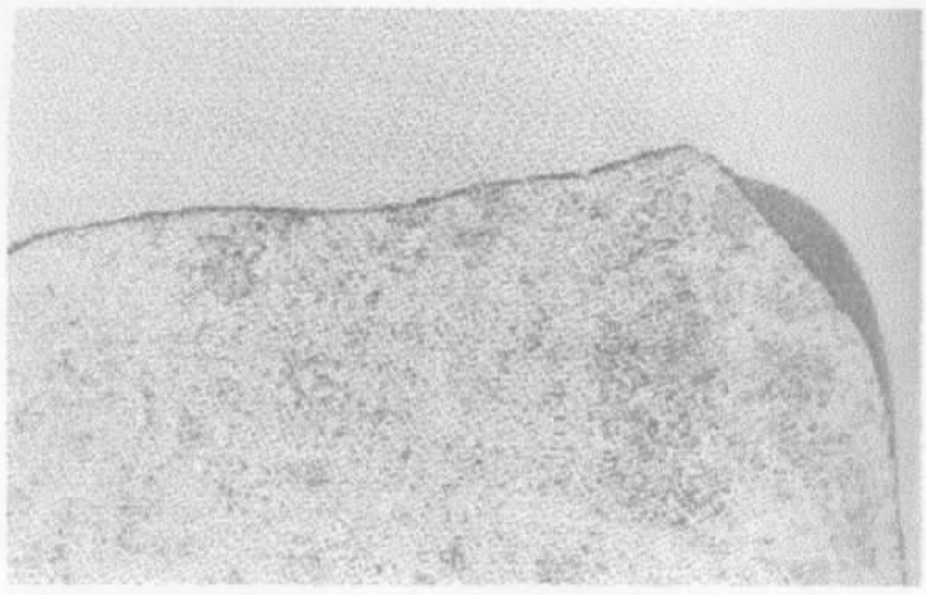

Foto7
A 0.01 - inch crust on a cut slab of a Bruderheim stony meteorite.

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Quadro 1

COMPARISON OF COMMON MINERALS IN EARTH'S CRUST AND METEORITES

Mineral	Description	Common Earth Rock	Meteorite
Feldspar	An aluminum silicate with varying amounts of sodium and calcium.		5–10% in chondrites
	Plagioclase ($NaAlSi_3O_8$ to $CaAl_2Si_2O_8$); 39% in crustal rock	Granites, basalts	Ca-rich achondrites
	Orthoclase ($KAlSi_3O_8$); 12% in crustal rock	Granites	Absent
Pyroxenes	A large group of silicate minerals with varying amounts of iron, magnesium, and calcium $(Fe,Mg,Ca)SiO_3$; 11% in crustal rock	Mafic rocks, basalts	All stony meteorites, mesosiderites
Olivine	A silicate with varying amounts of iron and magnesium $(Fe,Mg)_2SiO_4$; 3% in crustal rock	Mafic rocks, basalts	All chondrites, pallasites
Quartz	A very common rock-forming mineral (SiO_2) on Earth; 12% in crustal rock	Silicic rock	Very rare
Amphibole	A large and complex family of dark, hydrous ferromagnesian silicate minerals; 5% in crustal rock	Most crustal rock	Absent
Mica	A common complex hydrous silicate mineral containing varying amounts of magnesium, iron, potassium, and aluminum; 5% in crustal rock	Silicic and mafic rocks	Absent
Nickel-iron	Alloys of iron, nickel, and cobalt	Very rare	Common in all meteorites
Troilite	An iron sulfide (FeS)	Pyrrhotite on Earth	Irons and stony-irons
Magnetite	A common black oxide of iron (Fe_3O_4)	Common iron ore	Carbonaceous chondrites, fusion crusts
Serpentine	A class of water-bearing silicates with varying amounts of iron and magnesium $(Fe,Mg)_6\ Si_4O_{10}(OH)_8$	Common metamorphic mineral derived from olivine	Carbonaceous chondrites

Fonte: Norton, O. R. - 1994

Efeitos do intemperismo sobre os meteoritos: Aproximadamente $^2/_3$ dos meteoritos conhecidos são do tipo *finds*, e que têm estado expostos ao intemperismo por anos, ou, mesmo, séculos. As condições físico-químicas da superfície da Terra são altamente agressivas a esses corpos extraterrestre. Em ambiente desértico, a amplitude térmica elevada provoca expansão / contração, gerando fendas, especialmente na crosta de fusão. A contração rápida em clima frio, também provoca esse efeito. Uma crosta de carbonato de cálcio (caliche) é freqüentemente observada nos meteoritos encontrados em desertos. Em clima úmido, os sideritos rapidamente oxidam, tornando-se laminados (tipo folhelho).

Mesmo após coletados e acondicionados em dispositivos protetores, a ação do intemperismo ainda pode ser efetiva. Isso é especialmente registrado nos meteoritos ferrosos devido à presença de um cloreto ferroso (lawrencita), que oxida formando cloreto férrico e limonita, provocando exudações e desagregação do material.

A passagem atmosférica

Os meteoróides são submetidos a um rigoroso teste antes que possam se tornar meteoritos. Eles têm de sobreviver à passagem através da atmosfera da Terra.

Esses corpos extraterrestres deslocam-se no espaço com velocidades cósmicas. Dependendo da orientação desse deslocamento, em relação ao movimento de translação da Terra (cuja velocidade é da ordem de 30km/s), a velocidade na entrada atmosférica situa-se entre 16 e 40km/s.

O atrito com as moléculas de ar provoca aquecimento superior a 1.100 ºC, e desintegração total ou parcial do corpo, produzindo ainda luz (***fireballs***) e som. (**Foto 8**)

A maior parte dos meteoróides tem dimensões variando de milésimos de polegadas ao tamanho de uma ervilha. A média fica em torno de um grão de areia. Partículas dessa dimensão são totalmente consumidas no contato atmosférico. Corpos maiores podem subsistir.

As Bolas de Fogo (*Fireballs*)

A luz das *bolas de fogo* é gerada de dois mecanismos distintos:

- a incandescência do meteoro;
- a incandescência da atmosfera em torno do corpo sólido aquecido.

Ao adentrar na atmosfera, o meteoróide converte parte de sua energia cinética em calor, fundindo sua parte externa e tornando-se incandescente. Com o progressivo aquecimento, o ar em torno da rocha incandescente começa a ionizar (perder elétrons). Quando os gases atmosféricos recapturam esses elétrons, eles, também, se tornam incandescentes, liberando luz. A massa de ar incandescente pode ser centenas de vezes maior que o meteoro que a gerou.

As *bolas de fogo*, vistas da Terra, são, fundamentalmente, um rastro luminoso de gás aquecido. As cores dessas *bolas de fogo* dependem, assim, da composição do meteoróide e da composição do ar, uma vez que, quando vaporizados, muitos elementos químicos produzem cores diagnósticas. (Ex: o sódio produz uma cor amarela intensa; o níquel, cor verde; o magnésio, cor azul clara; o oxigênio, vermelha; o nitrogênio, verde.)

O som

Um objeto (um avião, por exemplo) deslocando-se à velocidade do som (340 m/s / 1.224 km/h) gera, à sua frente, uma onda de pressão (*pressure wave*), ou onda de choque (*shock wave*), que é ouvida no terreno como uma explosão.

Os meteoros geram ondas semelhantes, porém, como deslocam-se a velocidade muito maiores que o som, eles o precedem, em alguns segundos - e até mesmo alguns minutos.

Se o meteoro fragmenta-se em vários pedaços, cada fragmento provocará suas próprias *ondas de pressão*, que serão ouvidas como sucessivos estrondos (como trovões) à medida em que há uma superposição (*overlap*) dessas ondas.

Há registros de sons semelhantes a um pneu de carro esvaziando. Pode ser resultado do movimento de rotação de um corpo irregular, comum nos meteoritos.

Efeito do Impacto e perda de massa

Mudanças muito rápidas ocorrem em um meteoróide quando sua energia cinética é convertida em calor e luz.

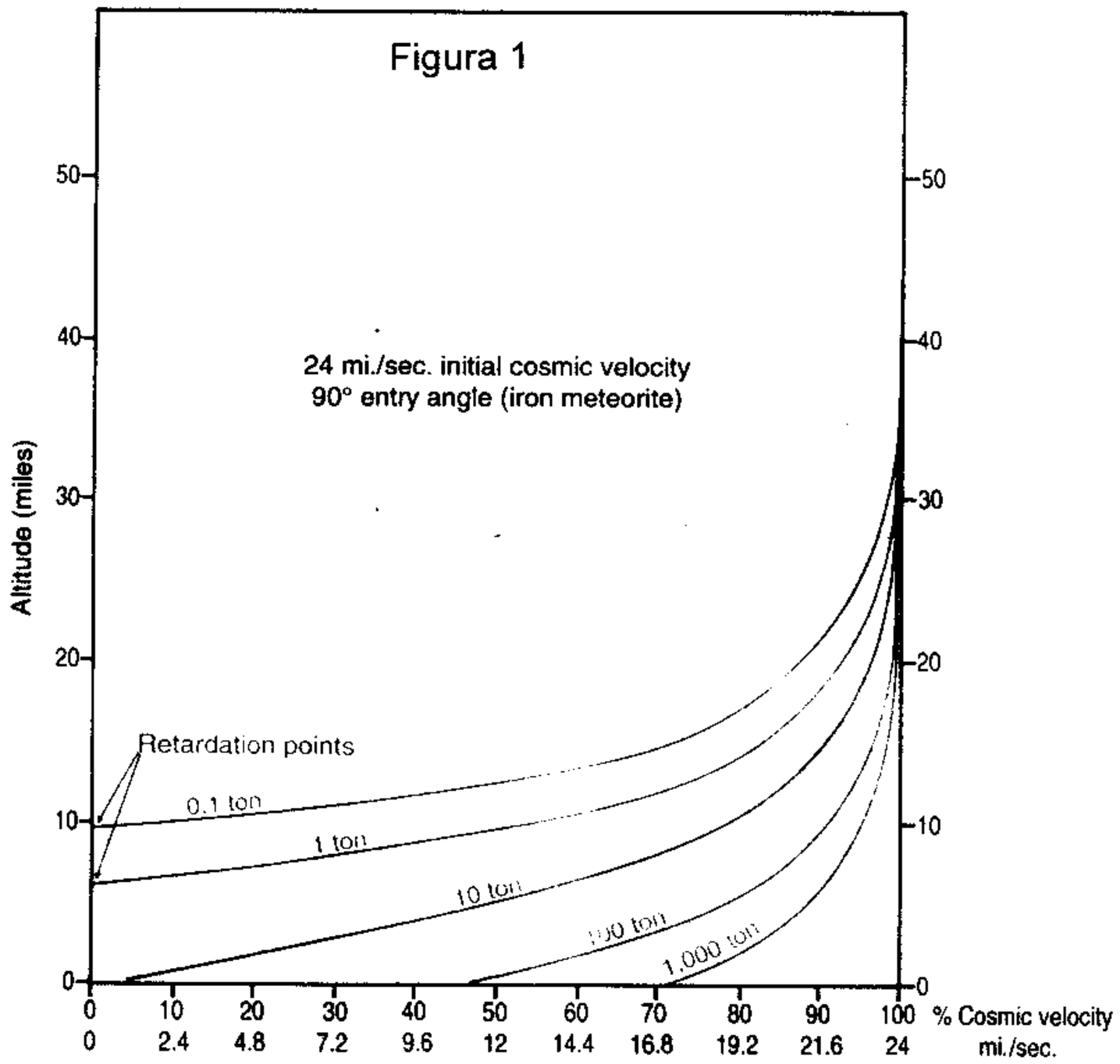
A perda de massa, a fragmentação, bem como a velocidade com que um meteorito se choca com o terreno, dependem de um conjunto de fatores como sua velocidade cósmica inicial; o ângulo de entrada na atmosfera; o sentido desse deslocamento em relação aos movimentos da Terra; sua massa inicial e sua forma, além da composição.

Quanto maior o meteoróide, maior o percentual de retenção de sua velocidade cósmica. A **figura 1** ilustra essa relação. Meteoritos de até 1t perdem essa velocidade cósmica ainda a algumas milhas acima da superfície, complementando seu percurso sob ação da gravidade.

Não se conhece meteorito na classe de 100t ou mais. Considera-se que eles não consigam sobreviver ao impacto com a Terra, praticamente destruindo-se, e deixando uma cratera como registro desse impacto (**foto 9**, **figura 2**)

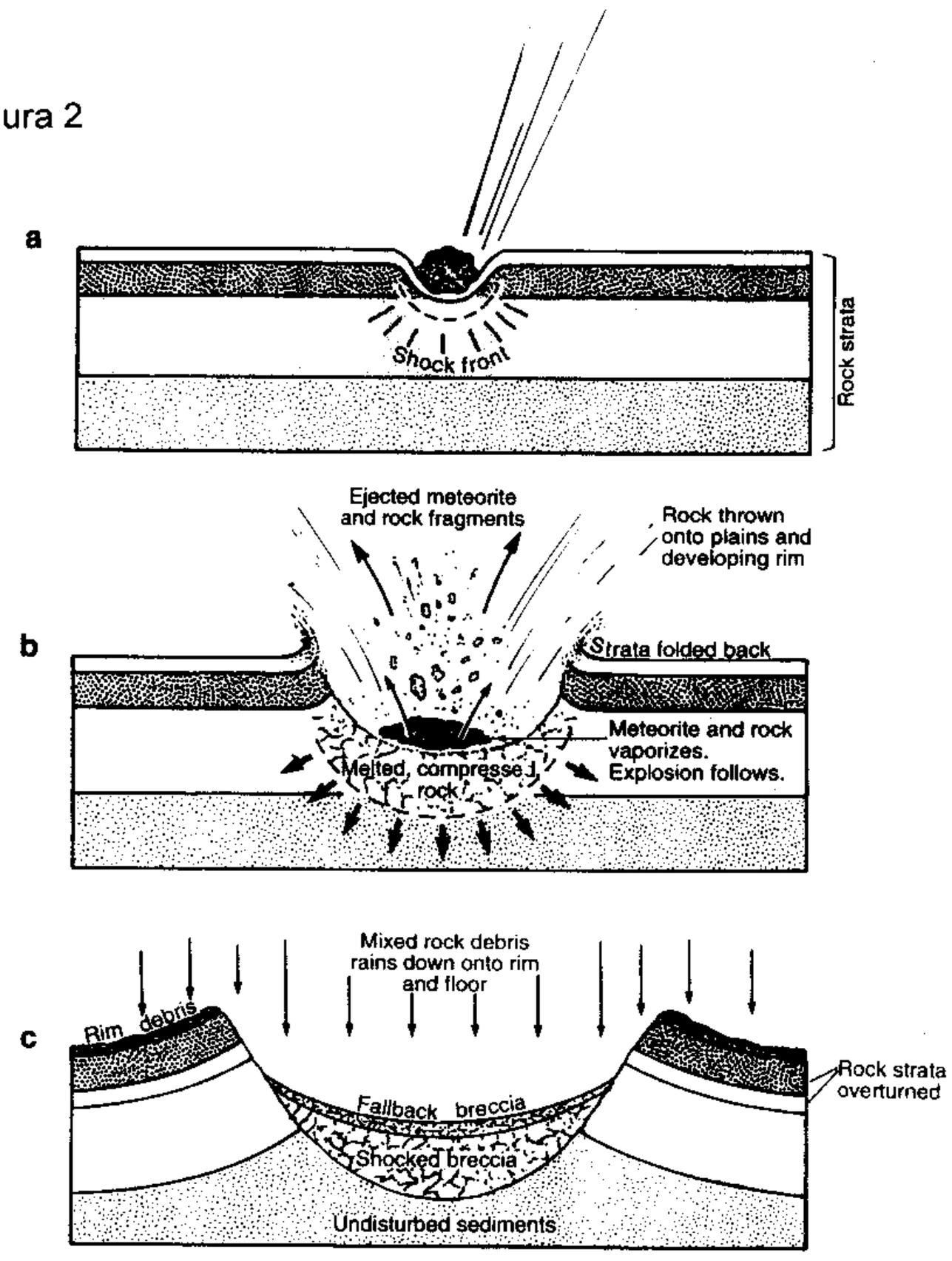
Assim, dependendo do substrato, o meteorito pode formar pequenas crateras, igual ao seu diâmetro, ou um pouco maiores, e, até mesmo, não penetrar no solo. Podem, também, explodir, fragmentando-se enquanto ainda no ar, reduzindo ainda mais os efeitos do impacto.

Figura 1



The atmospheric entry velocity of a meteoroid varies with initial mass and entry angle. Most meteoroids lose their cosmic velocity several miles above Earth, but meteoroids of greater than 10 tons strike the ground with a percentage of their cosmic velocity intact. **–Data from Heide 1964**

Figura 2



Sequential stages leading to the formation of Meteor Crater. **a:** *Meteorite penetrates surface and sends shock wave through rock layers.* **b:** *Decompression wave displaces rock outward onto rim and plains. Shock wave traveling from front to back of meteorite expels meteorite fragments. Remaining meteorite explosively vaporizes.* **c:** *Rock and meteorite debris from dust cloud rain down on crater and surrounding plain.*

Há referências a incêndios associados à queda de meteorito, como em Tunguska (Sibéria, 30 de junho de 1908), por exemplo, onde a devastação florestal (**foto 10**) atingiu uma área de centenas de km^2. Nesse local, nenhum meteorito foi encontrado. Análises microscópicas refinadas, em material coletado na área, revelaram, porém, a presença de pequenas esferas de matéria considerada de origem meteorítica. Para o caso Tunguska, admite-se que o meteoro explodiu próximo (≅ 8km) ao solo e que as *ondas de choque* geradas destruíram a floresta, derrubando as árvores em um arranjo radial. (Há explicações alternativas para o evento de Tunguska, conforme descrito na 2ª Parte deste Relatório).

A Antártica

Esse continente é um paraíso para caçadores de meteoritos. Lá, esses corpos são mais facilmente recuperados devido a carência de exposições rochosas e vegetação, permitindo maior contraste entre o terreno e os fragmentos meteoríticos. São também melhor preservados e encontram mecanismos naturais (associados à movimentação das geleiras) que favorecem sua concentração (**figura 3**).

O preço de um meteorito

Conhecimento não se adquire de graça. Especialmente para fins científicos, ou para colecionadores, um meteorito pode valer uma boa soma em dinheiro. O valor dependerá de vários fatores, entre os quais a demanda, o tipo de meteorito e seu estado de conservação. Os *condritos carbonosos* e os *acondritos* são mais disputados, por sua relativa raridade.

Os preços variam entre limites muito amplos, desde U$ 0,25 a U$ 50,00 /g.

A transição Cretáceo-Terciário (K-T) e sua provável relação com um *Impact Event*

O fim do período Cretáceo foi caracterizado pela extinção de grandes grupos de animais e plantas, incluindo dinossauros, grandes répteis marinhos, répteis voadores, amonites e belemnites, entre outros, sendo considerado como um dos mais dramáticos eventos de extinção em massa já registrados. Tem sido estimado que pelo menos 75% das espécies viventes naquele período podem ter sido eliminadas. Numerosas teorias tem sido propostas para explicar a natureza deste evento. No entanto, o problema da maioria dessas teorias é que elas se baseiam em poucos dados físicos.

Evidência física para mecanismos de extinção tem sido fortemente suportada por uma delgada camada de argila, de 1 a 30 cm, que marca a transição Cretáceo-Terciário. Essa camada, depositada durante a transição K-T, há aproximadamente 65 Ma, contém fortes evidências de um impacto de um corpo extraterrestre que teria atingido a Terra no final do Cretáceo, causando uma extinção massiva.

Essa camada de argila, da transição K-T, é enriquecida em Ir e outros elementos siderófilos, como: Ni, Co, Ru, Rh, Pd, Os, Pt e Au, em fatores na ordem de 5 a 4.000 vezes em relação à média crustal. Tal enriquecimento é global, em extensão, e já foi registrado em

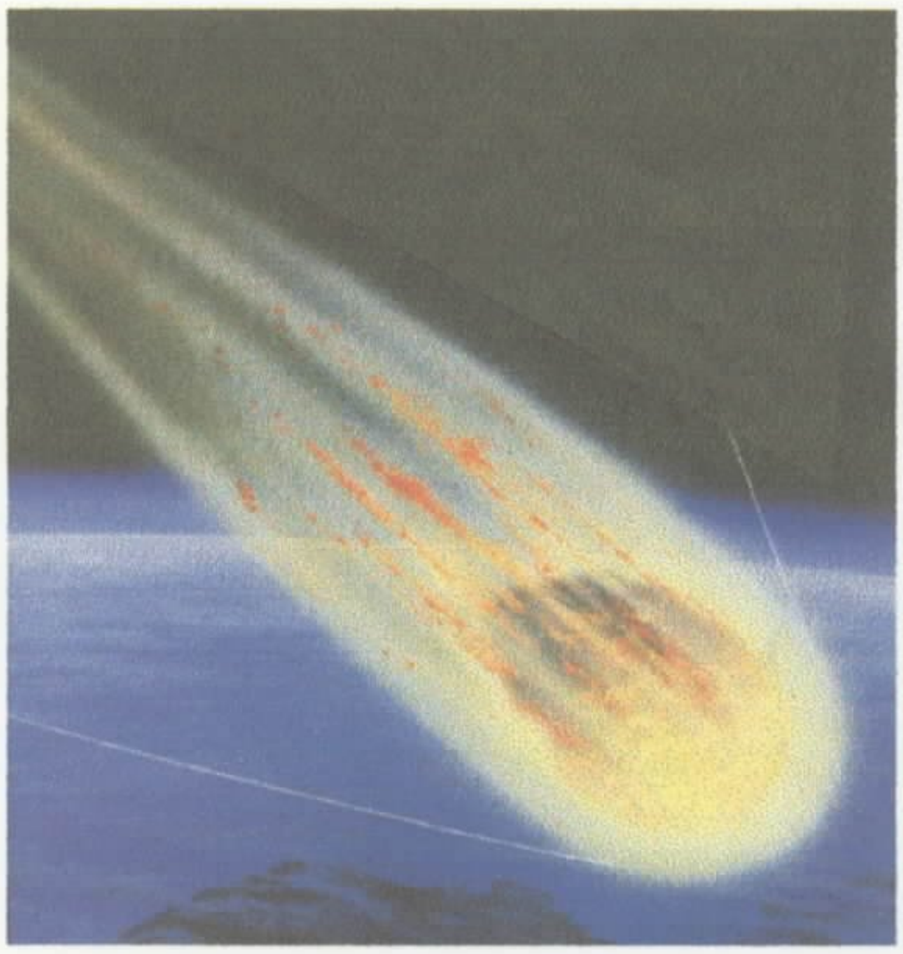


Foto 8
Pequeno asteróide entra na atmosfera da Terra, deixando um rastro de poeira e luz, e provocando ondas de choque.
Ilustrado por Dorothy S. Norton. In: Norton, O.R. - 1994

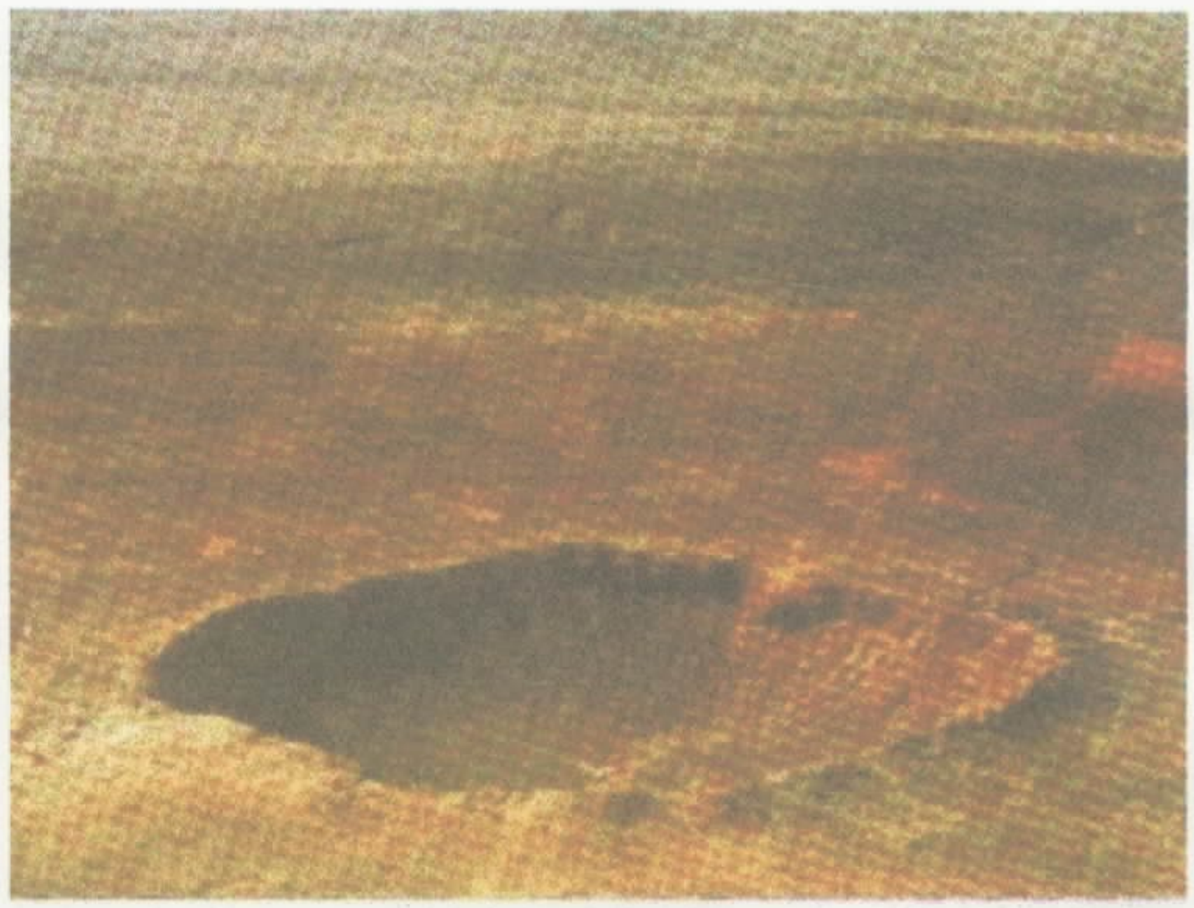
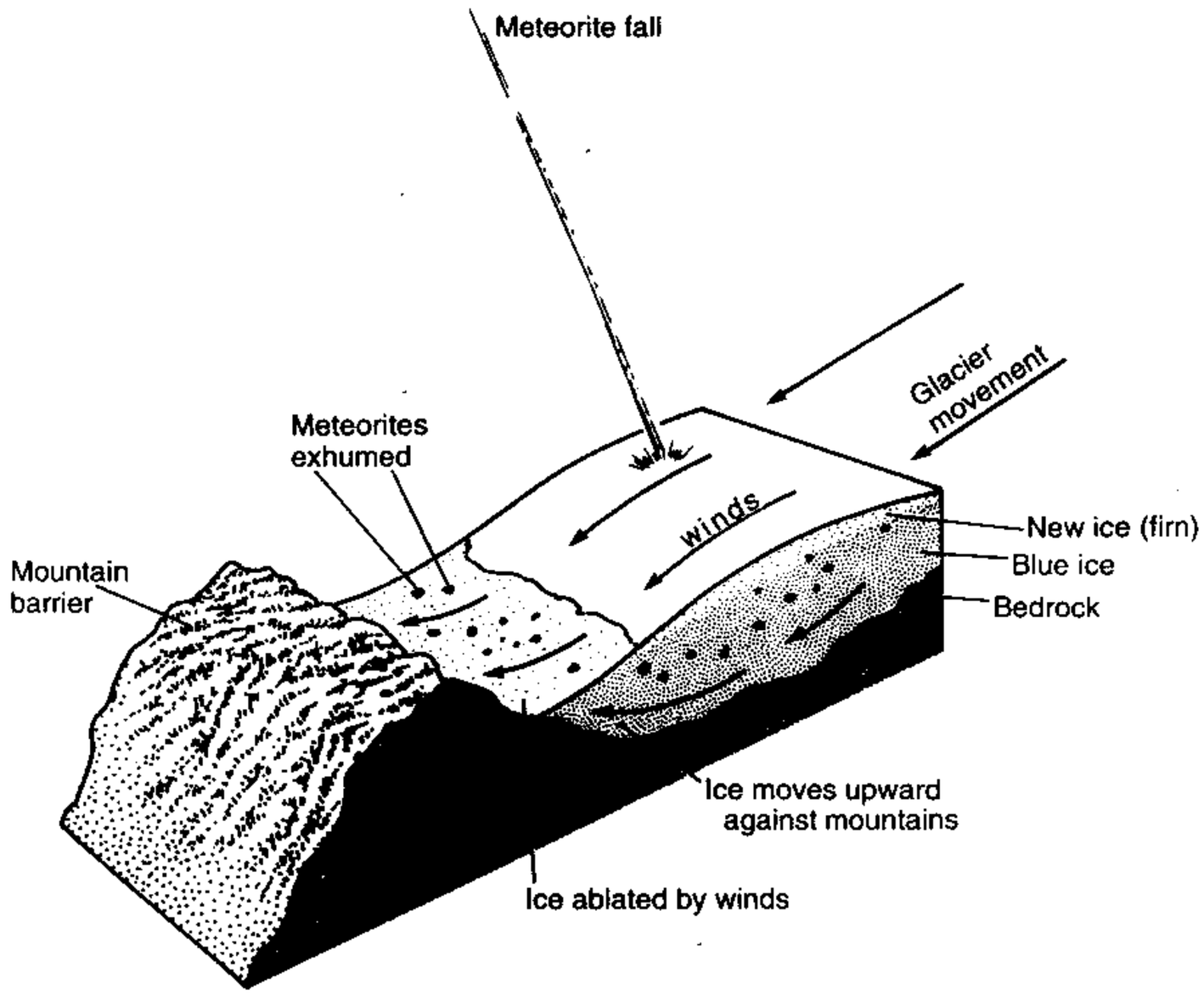


Foto 9
Vista aérea da *Meteor Crater*, no Arizona (USA).

Foto 10
Árvores caídas em Tunguska, cerca de 5 mihas do ponto de explosão. L. A. Kulik photo.
Smithsonian Institution. In: Norton, O. R. - 1994

Figura 3



Natural glacial movement accumulates and exhumes buried meteorites against mountain barriers in Antarctica.

mais de 75 locais onde ocorre a transição K-T. Isso significa que a anomalia siderófila poderia ter sido causada por um evento de escala global em um curto período de tempo. O evento catastrófico não poderia estar relacionado a uma mudança brusca na composição química dos oceanos porque a anomalia é encontrada tanto em sedimentos marinhos como em não-marinhos.

MISTÉRIO NO ALTO XINGU
Um possível fenômeno meteorítico?

PARTE 2

(Ações desenvolvidas para desvendar o mistério)

O MISTÉRIO NO XINGU

Generalidades

A reportagem do jornal o Diário do Pará, do dia 19 de outubro de 1999 (anexas) retrata com fidelidade o clima de curiosidade reinante na população da região do Alto Xingu, ante a suposta queda de um objeto-não-identificado na Ilha do Zé Bispo, no dia 9 daquele mês.

Acompanhando uma equipe de reportagem da Rede Brasil Amazônia, à qual aquele jornal está integrado, os autores deste relatório estiveram no local do ocorrido, uma vez que a descrição dos fatos favorecia a hipótese de tratar-se da queda de um meteorito.

A reportagem do dia 25 de outubro de 1999, constante em O DIÁRIO DO PARÁ, relata os detalhes dessa incursão. A matéria foi divulgada, no mesmo dia, também em cadeia nacional de televisão (Rede BAND).

Documentação fotográfica complementar é apresentada ao final deste relatório.

A Equipe

Ronaldo Vilhena - Repórter da RBA

Reginaldo Custódio - Cinegrafista

Osvaldo Forte - Repórter Fotográfico

Rômulo Simões Angélica - Geólogo, UFPA

Nélio G. A. da Mata Rezende - Geólogo, CPRM - Serviço Geológico do Brasil

Roteiro das atividades (com indicação dos horários aproximados)

Dia 21.10.93

09h 30 min - Saída de Belém, em aeronave bimotor.

12h 00min - Chegada em São Félix do Xingu (06°38'27"S/51°57'30"W).

Dia 23/10/99

10h 00min - Saída de São Félix do Xingu, em aeronave tipo *Skylander.*

10h 55min - Chegada na aldeia *Kukranin*, ou Maria Preta (07°43'12"S/52°45'10"W).

Ouvido alguns depoimentos de índios dessa aldeia.

11h 20min - Deslocamento rio acima, em voadeira de alumínio, com motor de popa.

(Motorista do barco e guia Hermógenes; proeiro Dilcinei).

13h 30min - Chegada na aldeia Kamianjó, ou Kanianjú (?), ou Aldeia do Zé Bispo (08°05'07"S/52°41'40"W).

Entrevista com os índios que presenciaram o fenômeno.

14h 00min - Deslocamento para a Ilha do Zé Bispo, localizada bem próximo à aldeia (08°05'07"S/52°42'30"W).

Inspeção no local do *acidente*.

15h 30min - Retorno à aldeia Maria Preta.

17h 10min - Retorno aéreo para São Félix do Xingu.

Dia 24/10/99

14h 00min - Deslocamento São Félix do Xingu / Belém, com escala em Tucumã, para abastecimento da aeronave.

17h 40 min - Chegada em Belém.

Relatos de Testemunhas

Escutamos diversos relatos sobre o evento. Em São Félix do Xingu (distante da Ilha do Zé Bispo ≅175km) havia muita especulação, e as versões já eram uma *recontagem* da estória.

Na aldeia Maria Preta, cerca de 40 km ao norte da Ilha do Zé Bispo, registramos o depoimento de índios, em português fluente. Segundo esses índios, *passou um "avião" bem alto, soltando fumaça escura e fazendo muito barulho e desapareceu por trás da serra* (adjacente à aldeia – ver foto). *Pouco depois se ouviu um barulho tipo explosão*. Tomamos uma bússola e pedimos para os índios nos mostrarem o movimento do "avião". Eles apontaram para o alto (≅ 60º) indicando que a "aeronave" passou pelo flanco W da aldeia, deslocando-se aproximadamente segundo NNW-SSE.

Na aldeia Kamianjó (Zé Bispo), ouvimos uma testemunha ocular do evento: o índio Kruakrukré. O dia estava claro e ensolarado e ele estava na beira do rio, tratando peixe, e viu quando um objeto fazendo ruído semelhante a um avião a jato, deixando um rastro de fumaça, passou bem alto, próximo à aldeia. Segundo Kruakrukré, *logo em seguida a gente ouviu muito barulho, de explosão, e a terra tremendo. Foi tudo muito rápido. Depois vimos o fogo e fumaça na ilha. Ficamos com medo.*

Kruakrukré admitia que o objeto assemelhava-se a um avião. Reconstituindo as indicações desse índio sobre o deslocamento do "objeto" constata-se a mesma orientação registrada na aldeia Maria Preta: NNW-SSE (≅ N140º a N160º).

Um ponto que não ficou bem definido no depoimento de Kruakrukré é se o objeto que passou alto e deixando rastro de fumaça foi o mesmo que explodiu. A altura do objeto e a indicação do seu movimento (≅ horizontal) sugerem que não.

Kruakrukré contou que uma equipe do SALVAERO, da Força Aérea Brasileira, já havia estado na área, e que os índios abriram uma picada na mata, para acesso ao local, onde ainda havia fogo. Segundo esse depoente, os militares coletaram material, que ele não sabia precisar o que era. Esse fato foi confirmado pelo motorista do barco, Hermógenes, que esteve no local com os militares.

Madeireiros que trabalhavam na área, cerca de 20 km a norte, também registraram a explosão e tremor de terra, conforme depoimento do trabalhador Gildemar Santana de Souza, constante da reportagem de *O Diário do Pará*, a seguir transcrita: *"Nunca tinha visto*

nada igual em minha vida. Pensei que fosse uma bomba, porque balançou tudo." Essa versão foi confirmada pelo motorista do barco Hermógenes, que transportou nossa equipe e que se encontrava na área, no dia do ocorrido.

O FOCO DAS ATENÇÕES

Da aldeia Kamianjó avistava-se a Ilha do Zé Bispo. Nossa equipe deslocou-se de barco até aquele local, seguindo depois a pé, por cerca de 100m, aproveitando a mesma picada de acesso usado pelo pessoal da FAB. O cenário encontrado foi, realmente, surpreendente:

• Uma floresta bosqueada, onde o fogo deixou sua marca, principalmente na vegetação mais baixa, provavelmente devido à queima da folhagem seca, abundante nas matas da Amazônia;

• Havia árvores caídas, como que arrancadas do solo, mas espaçadas entre si de muitos metros, e sem uma orientação preferencial. Quedas aparentemente aleatórias;

• As cinzas, no solo, e os efeitos do fogo, dificultaram diagnosticar se todas essas árvores haviam caído recentemente. Em alguns casos parecia que sim,

• Os buracos deixados nos pés das árvores caídas foram as únicas "*crateras*" que encontramos;

• Não localizamos clareira, ou cratera, que pudesse caracterizar um ponto focal do incêndio, ou um ponto de impacto e explosão, epicentro do tremor ocorrido naquela terra;

• Nenhum fragmento de rocha também foi encontrado. A cor escura do solo, coberto de matéria vegetal carbonizada, pode ter contribuído para mascarar a aventada presença desses fragmentos;

• Nos troncos das árvores que permaneceram em pé, não se observou marcas de impacto de estilhaços derivados da possível fragmentação de um corpo sólido, natural ou artificial;

• Decorridas duas semanas do acidente, ainda havia pequenos focos de incêndio, em trocos de árvores caídas. (Esse fato não é inusitado. É passível de ocorrer quando se broca e faz a *queimada* da mata, especialmente na época da estiagem. Porém, na época do evento, ainda estava chovendo ocasionalmente na região);

• Alguns membros da equipe, entre os quais o geólogo Rômulo Angélica e o repórter Ronaldo Vilhena, perceberam um *cheiro forte,* não identificado. Aparentemente não se tratava de pólvora queimada, ou de qualquer produto inflamável conhecido. (Esse odor, de ocorrência localizada, pode ter sido originado da queima de algum tipo de madeira, desconhecido da equipe, ou estar associado diretamente ao evento).

• Medições do índice de radioatividade no local mostraram-se compatíveis com os valores do *background* regional (50 a 70 cps).

O QUE OCORREU?

O mistério permanece!

Diversas hipóteses levantadas, conforme registrado nas reportagens da RBA, foram, de pronto, descartadas, especialmente as relacionadas à queda de uma aeronave; testes militares, com bombas superpotentes; despojo de lixo atômico na mata; ou combate à extração ilegal de madeira. Uma equipe da Aeronáutica esteve no local, bem antes do nosso grupo, e essa instituição militar afirma *não ter encontrado qualquer objeto (aeronave, meteorito ou algo qualquer) que tivesse se precipitado sobre o solo*).

A hipótese da queda de um meteorito, entretanto, não pode ser desconsiderada. Outras possibilidades aventadas relacionam o evento à ocorrência de fenômenos geofísicos, ou meteorológicos (climáticos).

A hipótese do meteorito

Essa possibilidade não está descartada. A inexistência de crateras ou fragmentos de rocha, no local, não invalida essa hipótese. Algumas características, embutidas nos relatos de testemunhas, enquadram-se no leque de fenômenos associados à queda de um meteorito:

- **O rastro de fumaça escura** – Pode ser a poeira resultante do processo de ablação e desintegração do meteorito, devido ao atrito com a atmosfera;
- **A explosão** – Alguns meteoritos fragmentam-se de forma explosiva durante o impacto no solo, ou mesmo quando ainda na atmosfera. Essa explosão em geral pode ser captada dezenas de quilômetros do local onde ocorreu.

  Dependendo da velocidade do meteorito (quando acima da velocidade do som), pode haver geração de *ondas de choque*, ou *ondas de pressão*, que são sentidas no terreno como uma explosão. Essa ondas podem provocar a queda de árvores.
- **O tremor de terra** - Dependendo da massa do meteorito e da sua velocidade, o impacto no solo pode provocar esse efeito, que poderá, até, ser detectado em estações sismográficas mais próximas do local;
- **O incêndio** – Há precedentes de registro de incêndio possivelmente associados à queda de meteoritos. Um caso famoso é o de Tunguska (Sibéria, 30.06.1908);
- **A inexistência de fragmentos do meteorito** – A desintegração explosiva pode ser tão intensa a ponto de pulverizar totalmente o meteorito. Algumas vezes os fragmentos existem mas são de difícil localização, por confundirem-se com o substrato escuro onde caíram. No caso do Xingu, a vegetação carbonizada pode estar dificultando essa localização.

O som semelhante ao de um avião – O movimento acelerado de rotação de um objeto irregular pode gerar som. Testemunhas do fenômeno de *fireballs* registram a ocorrência de um ruído semelhante ao esvaziar de um pneu de carro, ou ao produzido pelo rotor de um helicóptero (*whoomping*).

A hipótese do fenômeno geofísico

A da reportagem na BAND provocou a curiosidade de pesquisadores envolvidos com os temas OVNI, meteoritos e afins, que contactaram com os autores, via Internet, para intercâmbio cientifico. Entre esses, destacamos o geofísico russo **Andrei Ol'khovatov**, que aventou a hipótese de que o ocorrido no Alto Xingu poderia ser efeito de *um tipo raro de fenômeno geofísico, ainda sem designação formal, provisoriamente conhecido como* ***meteoro geofísico*** (ou como *nonlocal natural explosions – NNE).* Isto é, o fenômeno poderia ter uma origem tectônica endogênica, à semelhança do que muitos geofísicos e geólogos sustentam como passível de justificar o **evento de Tunguska**, na Sibéria.

Essa teoria refere-se a fenômenos luminosos (raios, línguas de fogo, bolas de fogo, flashes luminosos, objetos negros, nuvens...), algumas vezes acompanhados de explosões, associados a terremotos. Há uma tendência dessas *"luzes tectônicas"* direcionarem-se ao epicentro do terremoto. O mecanismo físico responsável por esse fenômeno ainda não está bem explicado.

Detalhes dessa hipótese podem ser encontrados em texto anexado a este relatório, ou no site (www.geocities.com/CapeCanaveral/Cockpit/3240).

Um detalhe, no mistério

Diversos depoimentos referem-se à passagem de um objeto ("avião"?), associado ao evento. Conforme comentado no ítem relativo aos depoimentos, não se confirmou se foi esse o objeto que teria provocado a explosão, no solo. Ressalta-se, porém, que a orientação do deslocamento desse "objeto" coincide com a rota de aviões comerciais no trecho New York - Rio de Janeiro.

Considerações complementares

• A reportagem teve ampla repercussão, inclusive a nível internacional. Pela Internet, os autores deste relatório foram contactados por pesquisadores interessados em OVNI, meteoritos e afins. Algumas correspondências são mostradas em anexo.

• Durante a estada em São Félix do Xingu os autores foram entrevistado no noticiário local da TV Xingu.

• Na parte de Anexos apresenta-se um interessante *folder* sobre meteoritos, elaborado pelo Governo do Estado da Bahia.

• Um aspecto que ainda está sendo investigado pelos autores é o possível registro do evento, nas estações sismográficas mais próximas da região.

AGRADECIMENTOS

Os autores agradecem à Direção da Rede Brasil Amazônia o convite para integrar a equipe de reportagem. Ao repórter Ronaldo Vilhena, ao repórter fotográfico Oswaldo Torres e ao cinegrafista Reginaldo, companheiros dessa aventura na busca do desconhecido. Agradecem também ao Professor Dr. Marcondes Lima da Costa, da Universidade Federal do Pará e ao geólogo Paulo dos Santos Freire Ricci, que forneceram importantes fontes de consulta sobre o tema meteoritos e astronomia. Ao físico russo Andrei Ol'khavatov, pela troca de idéias, via Internet, fornecendo novas interpretações sobre o famoso evento de Tunguska. Da mesma forma são gratos aos moradores do alto Xingu, que ajudaram a equipe a cumprir sua missão, em especial o empresário João Kleber, o motorista de barco Hermógenes e o proeiro Dilcinei, bem como aos índios Kruakrukré, Betikré e Caetê, caiapós da aldeia Kamianjó. Esses índios, mesmo tendo tido medo do que presenciaram, acompanharam as equipes ao local do *acidente*.

Fontes de Consulta

BAHIA. Secretaria da Indústria Comércio e Mineração. *Meteoritos*. O que é isso? Para que servem? Como identificar? – Salvador: Superintendência de Geologia e Recursos Minerais – SGM. /Folder preparado pelo Governo da Bahia/

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MARFUNIN, Arnold S. *Mineral matter in space,* Mantle, Ocean Floor, Biosphere, Environmental Management, and Jewelry. Berlin: Springer-Verlag, 1998. 444p. il.

MASON, B. *Principles of geochemistry*. 3ed. New York: John Wiley & Sons, 1958. 329p.

MOURÃO, Ronaldo Rogério de F. *Da Terra às galáxias*.- São Paulo: Melhoramentos, 1977. 229p. il.

NICOLSON, Iain. *Astronomia*. Tradução de Geraldo Galvão Ferraz. São Paulo: Melhoramentos,1970. 154p. /Série Prisma/

NORTON, O. Richard. *Rocks from space,* meteorites and meteorite hunters. – Missoula: Mountain Press, 1994. 449p. il.

Documentação fotográfica complementar

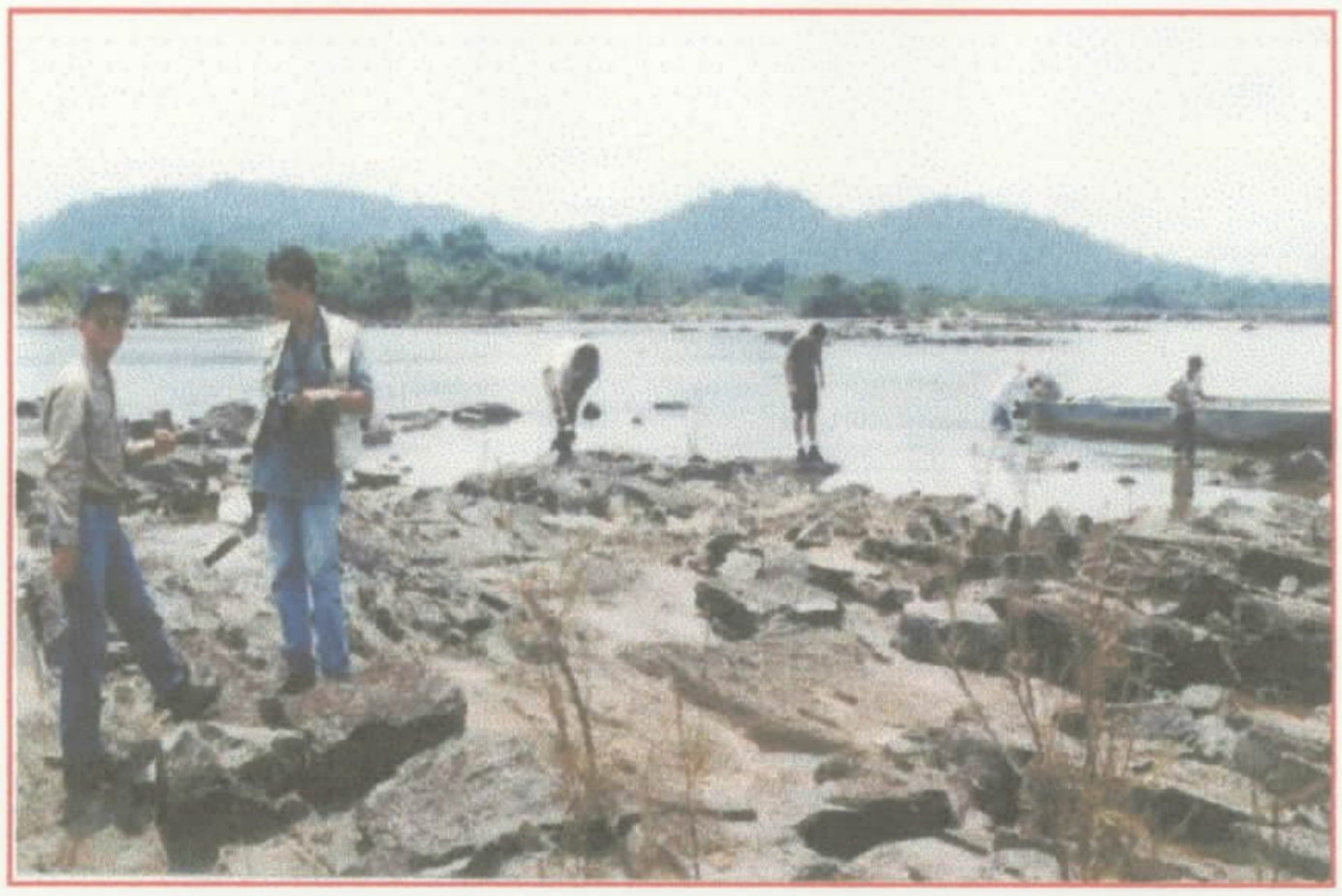
A partir da esquerda: o cinegrafista Reginaldo, o piloto José Maria, o geólogo Nélio, o repórter Ronaldo Vilhena, o repórter fotográfico Oswaldo Torres e o geólogo Rômulo. Ao fundo a aeronave do percurso Belém-S. Félix-Belém, no aeroporto de S. Félix do Xingu.

Visão panorâmica de São Félix do Xingu, na confluência do rio Xingu (1º plano) com o rio Fresco.

A serenidade da paisagem, em frente a São Félix do Xingu, contrastava com a inquietude da população, em face aos relatos da explosão provocada pela queda de um "objeto misterioso".

Aeronave usada no trecho São Félix do Xingu - Aldeia Maria Preta.

Pista de pouso na Aldeia Maria Preta

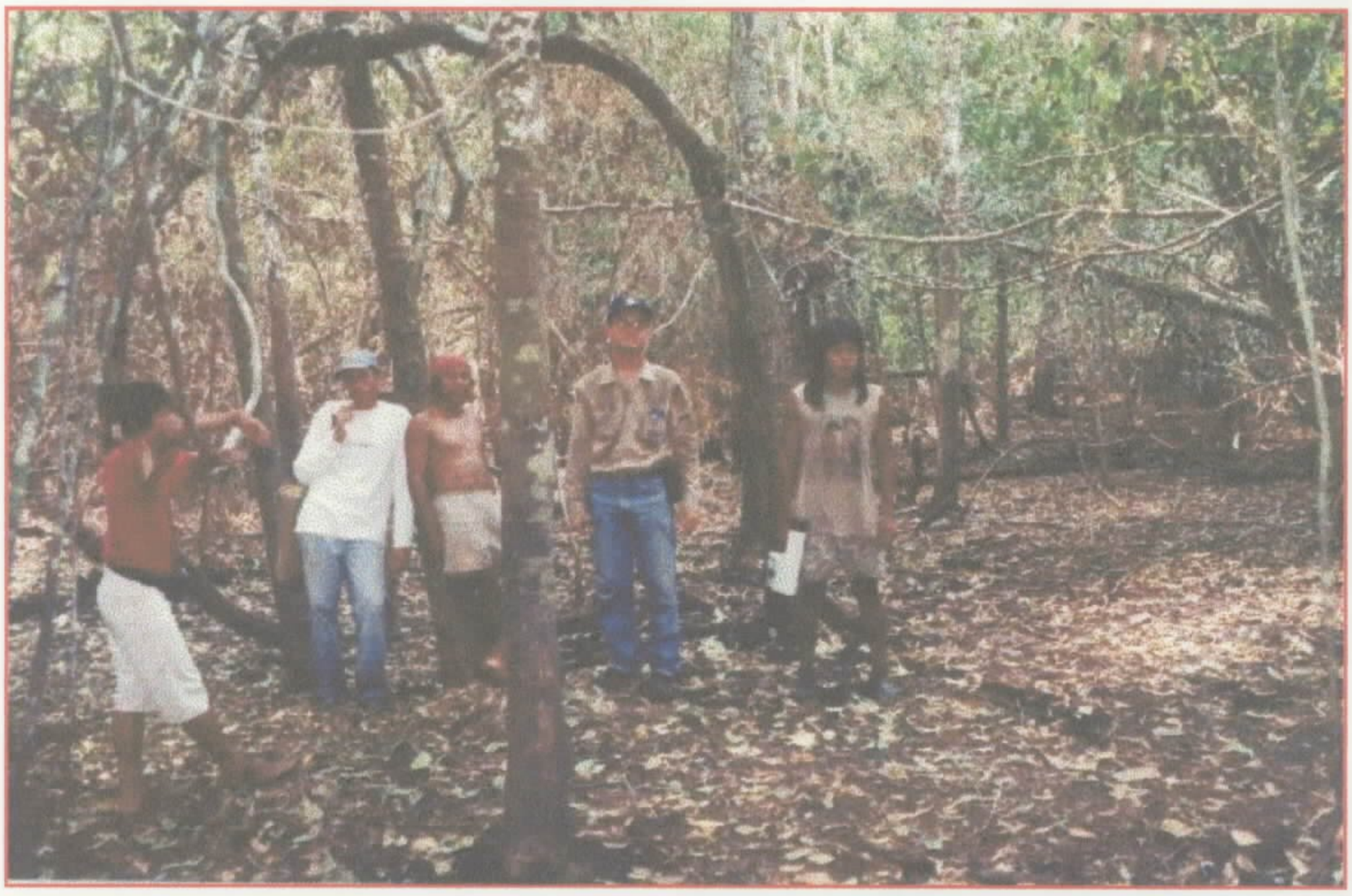


A equipe, após o desembarque para vencer corredeiras no rio Xingu.

Entrevista, na TV Xingu.

Os índios Kruakrukré, Caetê e Betikré (ao fundo), no cenário intrigante. A vegetação mais baixa ficou totalmente carbonizada. As únicas "crateras" são devidas a queda de árvores.

Kruakrukré contempla a mata devastada pelo fogo. O índio confessou ter sentido medo.



Outra tomada do bosque queimado. Além dos índios , o motorista Hermógenes e o geólogo Rômulo Angélica.

ANEXOS

DIÁRIO DO PARÁ

Segunda-feira, 25 de outubro de 1999

ANO XVII • Nº 5.653 • Edição de hoje: 36 páginas em 4 cadernos • A serviço do Pará e do Brasil • R$ 1,00

Oswaldo Forte

Este local, na ilha do Zé Bispo, em São Félix do Xingu, guarda intrigante mistério. Nem geólogo decifrou.

FOGO E CINZAS

CONTINUA MISTÉRIO NO XINGU

Afinal, o que aconteceu na ilha do Zé Bispo, em São Félix do Xingu? No solo, só há um enorme tapete de cinzas, árvores ainda queimando e nenhuma cratera, fragmento de material bélico, de meteorito ou de um suposto OVNI. O geólogo Nélio Rezende achou tudo muito estranho: "Não há evidência de nenhum fenômeno de impacto". Testes não revelam presença de radioatividade. **(A-8)**

RD REPÓRTER DIÁRIO

A Embrapa deverá alienar, até janeiro de 2000, cerca de dois terços da área que possui em Belém, anunciou neste final de semana o presidente nacional da empresa, Alberto Portugal. A área engloba, inclusive, o manancial do Utinga, que abastece a Região Metropolitana com água potável. Uma das exigências é que a área continue de uso ambiental, sob a administração do Estado ou Prefeitura de Belém. Quanto às atividades da Embrapa, Portugal afirma que as pesquisas não serão afetadas, já que a maioria dos projetos são desenvolvidos fora da área de Belém. Atualmente, a empresa concentra, no Pará, uma área correspondente a 117 bosques Rodrigues Alves. Além da alienação, o Conselho de Administração da Embrapa decidiu também leiloar alguns imóveis da empresa. Os recursos conseguidos através dos leilões serão investidos em pesquisas agropecuárias.

Reconhecimento

Pressionados pelos leitores, alguns órgãos de imprensa reconheceram, ontem, a importância da informação que o **DIÁRIO** tem veiculado desde o dia 17, sobre o fenômeno numa ilha do rio Xingu, no município de São Félix.

No dia 9, os moradores da localidade de Zé Bispo viram um clarão na ilha, depois de um estrondo, como se algum objeto ali tivesse caído. Em seguida, a mata começou a pegar fogo. Acionada, a Aeronáutica não encontrou vestígios de acidente aéreo no local.

Mistério

Durante quatro dias, jornalistas do **DIÁRIO** e da TV RBA estiveram na ilha do Zé Bispo, acompanhados de dois geólogos da CPRM e UFPa. O território foi vasculhado, inclusive com equipamentos que medem o nível de radioatividade, mas não foi encontrado nenhum destroço que indicasse a queda de uma aeronave ou a explosão de uma bomba.

Para os técnicos, o mistério continua, pois várias árvores foram arrancadas pela raiz, outras têm as copas quebradas ao lado de algumas intactas e o fogo continua, apesar das chuvas na região.

Vandalismo

Uma onda de vandalismo tem acontecido contra os sinais náuticos mantidos pela Marinha na região amazônica. São furtos e depredações de painéis solares e de baterias do sistema de iluminação de bóias e faroletes. A destruição desses equipamentos está colocando em risco a navegação, além de onerar as despesas da Marinha, que gasta uma nota para recuperá-los.

O comando do IV Distrito Naval, em Belém, já acionou os sistemas de Segurança Pública do Pará e Amapá, para coibirem esse tipo de banditismo.

Alô, Dinah

Quem leu, ontem, nesta coluna, nota sobre os gastos dos assessores do governo estadual com telefones celulares, inclusive, com ligações para a mãe Dinah, sugere ao governador que contrate a advinha para o quadro de assessores do Palácio dos Despachos. Pois, assim, diz o leitor, não precisaria haver gastos com consultas via telefone e, ainda, pouparia bem mais o dinheiro do contribuinte.

Sem solução

O prédio que foi residência dos Governadores e hoje faz parte do complexo do Parque da Residência, em Belém, apresenta infiltrações. Só nas salas destinadas ao gabinete do secretário de Cultura já foram feitas várias reformas, ao custo de R$ 2,5 milhões, mas o problema continua.

Arte brasileira

A Comissão de Comunicação da Câmara Federal aprovou no dia 20, projeto que aumenta de 25% para 40% a alíquota de imposto de renda a ser paga pelos filmes estrangeiros. Este projeto dá nova redação ao artigo 2º da Lei 8.685/93, que trata da criação de mecanismos de fomento à atividade audiovisual.

O projeto revoga também artigo 72 da lei 9.430/96, que impõe incidência do imposto na fonte, com alíquota de 15%, sobre as importâncias pagas pela aquisição ou remuneração de quaisquer filmes ou eventos, mesmo os de competições esportivas das quais façam parte representação brasileira.

THE TECTONIC INTERPRETATION OF THE 1908 TUNGUSKA EVENT

(version 4)
Andrei Yu. Ol'khovatov
Russia, Moscow,

ANNOTATION

Here the author's idea is explained that the famous 1908 Tunguska event in Siberia was a manifestation of tectonic (i.e. geophysical) energy - roughly speaking, an extremely powerful case of the Barisal guns (brontides) phenomenon. If you are unaware about the latter, you could look at Encyclopedia AMERICANA or BRITANNICA for "Barisal". And you could read more in the article below!

CONTENTS

1. INTRODUCTION

The problem of the nature of the 1908 Tunguska event has already excited researchers over the course of many decades. In the morning of June 30, 1908, the ground trembled north and northwest of Lake Baikal in Central Siberia, and underground jolts struck panic into the hearts of the local population. Reports of a glowing body flying over came from various points of the territory. The Tunguska forest fall, called the "impact/explosion site" or the "epicenter" was discovered just in 1927 at 61 N & 102 E, i.e. in the northern part of the Tunguska event manifestations region. Various conjectures were soon offered in 1908 to explain the nature of the event. The most popular were a meteorite fall, a ball

lightning (or its formation) and an earthquake (because of the seismic phenomena). Since official science of the time put in doubt the existence of ball lightning, while the possibility of glow occurring during earthquakes was, as a rule, rejected, and a false report about a meteorite fall near a town of Kansk appeared, the general consensus was that a very large meteorite had come down in Siberia. Attempts to put forward any other interpretation had been quashed for many years. The situation has changed radically since early 1960-s, when no remnants of the hypothetical meteorite were found and some other facts appeared in the sight.

In [1] the author ("the author" in the present paper means "the present author" i.e. A. Ol'khovatov, unless otherwise stated) have proposed that the Tunguska was a tectonic (endogenic) origin. Later this interpretation was developed in [2-4] and in the most detail in [5]. The author also reported it at the International conference "Tunguska 95" (1995) in Moscow, Tomsk, and at the 1998 International Tunguska conference in Krasnoyarsk. No arguments against were put forward. On the contrary the idea gets a support by a group of geophysicists and geologists.

Recently the author got a proposal to place his point of view on Internet in English. The result is the present article. At first the author writes about the problems of the meteorite fall interpretation. Then the author gives examples of explosion-like manifestations of tectonic activity, which he proposed to call NNE and applies them to the tectonic interpretation of the 1908 Tunguska.

In the present paper a sign asterisk '*' means a multiplication, 'PI' means the PI-number i,e. 3.14159... , a sign '^' means raising to power (10^(-3)=0.001, for example). In the future the author hopes to present a more detail paper in English.

2. THE PROBLEMS OF THE METEORITE FALL INTERPRETATION

Here are, for instance, some of the problems. The author also advises to read Vasilyev N.V. article at http://www.galisteo.com/tunguska/docs/tmpt.html.

2.1. THE EYEWITNESSES ACCOUNTS

As above-mentioned, the reason to attribute the Tunguska to the fall of a meteorite was the reports about flying fiery body. For a science of 1908 it means just a meteorite and nothing else. But let's look at these 'flying bodies' carefully from our modern knowledge (here and below after geographical denominations, the distances from the Tunguska explosion epicenter and azimuths in degrees from the epicenter, measured from the north to the east are also given).

- Nizshne-Karelinskoye (465 km, 133). Extremely bright (it was impossible to look at it) luminous body was seen rather high in the north-eastern sky soon after 8 a.m. It looked like a tube (cylinder) and for 10 minutes moved down to the ground. The sky was clear, but only in the side, where the body was seen, a small dark cloud was present low above the horizon. While coming to the ground, the body dispersed (flattened) and at this place a large puff of black smoke appeared. Then a flame emanated from this cloud.

Some details of the observed phenomena and especially the duration hardly conform to the meteorite fall.

- Nizshne-Ilimskoye (419 km, 168). The fireball was seen which while going to the ground at first flattened into 'flying saucer'. Then coming nearer to the ground it transformed into 2 fire columns.
- Os'kino (330 km, 89). Innokentii Farkov said a gradually rising boom coming from afar was heard since morning hours. The old men, thinking their dying hours had come, were changing into clean shirts, and one of them even washed in the bath house to meet the death clean. The ground trembled as a black body flew past, trailing a fiery tail.
- Kezshma (214 km, 193). This settlement is a good example to demonstrate the strange (for the meteoritic interpretation) property of the Tunguska accounts: as usually different luminous phenomena were reported by different eyewitnesses from the same place. In Kezshma they were: a flying luminous cloud, multicolored luminous bands, a fireball, a flame over the northern horizon. For example, Kokorin A. K., the observer of the Kezshma meteorological station marked in the observational register (**pay attention to EVIDENTLY HIGH TRUSTWORTHINESS of this information!**) that at 7 a.m. two giant fiery circles appeared on the north. They persisted for 4 minutes and then disappeared. Soon after, noise, like a wind was heard. It came from the north to the south and its duration was 5 minutes. Then other sounds, resembling large cannon shots and crackling appeared. Windows trembled. These shots continued for 2 minutes, then a crackling like a gun shot appeared and persisted for 2 minutes. The sky was clear.
- Tetere (92 km, 165). Fire columns were seen in the north.
- Vanavara (65 km, 161). Nobody saw any fireball. A bright flame shooting up from the north horizon was seen.

The eyewitness's accounts are hardly conformed with the meteorite fall. Even just in a few days-weeks after the event different time was given by different people, from early morning to the afternoon. So was the duration - from a few minutes to an hour. Astronomer Yevgenii Krinov, writing in his book "The Tunguska meteorite" published in 1949, about this side of evidence frequently uses phrases like, "the eyewitnesses either confused the cardinal points or just forgot the details".

All researchers noted, however, that the stories told by the local Evenks sounded true and were nearly always confirmed by other evidences later. The following story was typical for the area close to the epicenter. Two Evenk brothers,

Chuchancha and Chekaren, sleeping in their tent (tepee) were suddenly awaken by shaking. They heard whistling sounds and "sensed a strong wind". One of them was pushed so heavily that his head struck a supporting pole and he fell on the hot embers in the fire-place. From outside came a hideous noise and sounds of trees falling. The brothers were about to dash out of the tent when a deafening thunderbolt clapped. The ground started to tremble and sway, and, a ferocious gust of wind toppled the tent. One of the men saw from under the immobilizing poles falling trees, their branches set on fire, and the dry unbrushed and moss burning. All the place was wrapped in smoke and it was so hot the brothers feared they "could be grilled alive". Suddenly a bright lightning flashed over the hill, as if another sun suddenly went up, and a series of thunderclaps followed immediately. Several more "lightning" flashes and claps of thunder, and the frightening sounds look like fading.

Evenk woman, Akulina, who was together with several Evenks in a tent (32 km, 125) said that suddenly "somebody strongly pushed our tent". Then it repeated again, and they fell on the ground. A loud noise came from outside, "somebody rattled and knocked the tent's cover". Suddenly bright light appeared, the bright sun was shining, strong wind was blowing". After "somebody fired (shot) and at once a whirlwind arrived". Akulina was frightened and lost consciousness. When she saw as a whirlwind "danced", she recovered. The whirlwind put her down. When she looked at the forest, she saw stems without branches and leaves. Many trees were put down. Wood bedding was burning. Ivan, her husband was thrown about 40 meters, his arm was broken and soon after he died (the another Evenk, who was in the tent told the same story, being interrogated independently).

Evenk, Ul'kigo (56 km, 176) said that suddenly in the early morning dogs began to howl, and small children cried. The persons inside the tent felt that "somebody began to knock the ground below them and to swing a tent". When Ul'kigo got out from the sleeping bag and began to put the clothes on, "somebody pushed the earth strongly" (right before it, "somebody fired from a gun a lot"). Suddenly again "just like somebody hit the earth". Utensils fell inside the tent. A loud thunderclap followed. When Ul'kigo got out from the tent, and looked at the sky, he suddenly saw a bright flash on the clear sky with following thunderclap. Ul'kigo was so frightened that he fell on the ground. He saw as wind put down trees and burning dry wood bedding. After Ul'kigo stood up, a whirlwind struck. The knocking, smoke and thunderclaps continued for some time.

Other eyewitnesses from the epicentral area gave similar reports. What has all that to do with the meteorite fall? Many other eyewitnesses also reported about luminous phenomena (columns, stripes, lightning, flame, red sky glowing, etc.) which hardly resembled the meteorite fall.

On the basis of the eyewitness's accounts, three probable trajectories of the "Tunguska spacebody flight" were reconstructed. The first one was southern i.e. the meteorite flight from the south to the north (proposed and supported by Voznesenskii A., Kulik L. and Astapovich I. since 1920-s). Then in 1949 Krinov Ye. put forward the southeastern trajectory. Finally in the early 1960-s the eastern trajectory was proposed based on eyewitness accounts as well as on a pattern of the forest fall. Clearly, the meteorite could not have come from so many directions!

2.2. THE FOREST FALL

The Tunguska spacebody explosion stimulation undertaken by Victor Korobeinikov, corresponding member of the Russian Academy of Sciences, with co-workers at the Academy's Computer Center has shown the internal energy of the spacebody to be commensurate with its kinetic energy to produce the existent forest fall [6]. In plain language, this means that the Tunguska meteorite had to be an enormous block of an explosive!

Moreover, it's possible to demonstrate that the explosion of the hypothetical Tunguska body must be practically completely due to its internal energy! It's because the shape of the treefall reveals the presence of a significant spherical component of the air-shock wave. But due to the law of a conservation of a momentum, the explosion due to a kinetic energy don't produce a spherical air-shock wave (a total momentum of a spherical air-shock wave is zero, while the total momentum of the bolide's generated air-shock waves is qual to the momentum of the disintegrating meteorite). The absence of the spherical component is clearly seen on Fig.4 of work [7]. In there the air-shock wave of the "Tunguska meteorite" (the latter is at 3 km/s speed, i.e. practically already transferred all his momentum to air-shock waves) is as must be - the conical one, which can't produce the shape of the Tunguska forest fall!

The researcher of the Tunguska forest fall V. Fast writes [8] that the shape of the air-shock wave front has been reconstructed from the field of mean directions of the tree-fall. In order to get a closed front, he had to use a field of directions forming an angle of about 87.5 degrees with the mean directions of the tree-fall, but not orthogonal to it. So the field of the mean directions of the tree-fall is vortex one.

In other words, the fallen trees near the epicenter were rotated from their radial (from the epicenter) position several degrees clockwise in average. But how the meteorite explosion could produce such vortex air-shock wave? Such air-shock wave must transfer a large torque. The evaluation by the author estimate it in order of 100-1000 billions of Newton*kilometre! The meteorite explosion couldn't produce it.

Another puzzle for the meteorite interpretation is the area of the forest fall on the ridge Chuvar (23 km, 279), which according to the local Evenks have formed the same morning as the general (Kulikovskii) one. It was discovered by the 1959 expedition. Its square is 30-40 sq. km. and the trees damage was found to occur in about 1908. The peculiarity of that forest fall is that trees were uprooted with their tops to the east (i.e. in the opposite of what expected from the meteorite fall direction). So the supporters of the meteorite fall prefer not to discuss it, or at least, talk just about accidental coincidence.

2.3. THE TREES BURN

Some cases of the ignition of wood bedding were reported up to 34 km from the epicenter [9] and even probably farther (see section 2.1). But according to the Tunguska meteorite model it means that everything alive would completely burn at the epicenter. For example, according to the Tunguska meteorite model, the radiant exposure at the distances 5-9 km from the epicenter is about 300 J per sq. cm [7]. It means that right at the epicenter the radiant exposure is about 1200-1700 J per sq.cm!

In reality many groups of trees survived at the epicenter [10,11]. Moreover, some of the single standing trees were without any traces of burn [11]!

From the character of the trees damage it concludes that at first was the breaking of branches and then a burn at the site of the break [9, 12]. In other words, for the meteorite explosion interpretation it means that the air-shock wave from the explosion came faster than light impulse!

It was confirmed in 1996 that about 15-60% of survived trees near the epicenter have lightning-like damage [13]. So even L. Kulik thought that the fall was accompanied with lightnings. But how the modern meteorite fall theory could explain many thousands of lightning strikes?

The author also would like to mention the local Evenks reports about spots of melted sand and soil.

2.4. THE SEISMIC PHENOMENA

Here are just several examples of the seismic phenomena accompanied the Tunguska:

- Troinaya guba (railroad post) (1034 km, 171). Noise, probably subterranean, was heard. Soon after rather large screes were found.
- Tolsty myis (1020 km, 170). About 8 a.m. the icon-lamp (suspended?) swung and the lamp-oil splashed out. The icon (picture) standing on a shelf fell.
- Zshyimigitskii stan (1017 km, 176). From 8 a.m. to 8.20 a.m. the majority of the population felt the shivering of the ground.
- Manzurka (860 km, 161). At about 12 a.m. subterranean rumble was heard accompanied with soft jolt.
- Korostelyovo (684 km, 215). Due to shocks the horses fell on their knees.
- Kansk (635 km, 217). The first shock caused the doors, windows and suspended lamps to swing. A rumble was heard. About 5 to 7 minutes later there was a second more severe shock also accompanied with a rumble. A minute later there was a further shock less severe than the preceding two.
- Eniseisk (609 km, 248). At some houses windows rattled and suspended lamps swung.
- Ingash (605 km, 213). Gendarme Denisenko L. in his very interesting letter of July 5 wrote that about 8 a.m. he was was sitting on a bench and suddenly felt sick (nausea), like he felt in 1906, when an earthquake took place. This time exactly the same feeling was. He lay down the bench and at this moment 3 strong thunderclap occurred, causing windows to rattle. The thunderclaps seemed to originate right to the north-east and very close to him. Peals of the thunderclaps came out on the surface of the ground with large noise to the south. It was cloudless, but it seemed like a bit of fog.
- Taishet (594 km, 204). At 6.30 a.m. severe shock. All houses shook. In the villages to the north from Taishet the shock was stronger and different objects fell in houses.
- Shamanskie vodomernyie postyi (591 km, 180). Windows vibrated, trees bent. Their leaves shook. It was clear and calm.
- Zolotie priiski (golden mines) (about 527 km, about 240). The buildings crunched. The equipment shook. Dust climbed from the ground. Horses fell on their knees. Utensils fell. Panic spread.
- Zaitsevo (501 km, 235). Windows rattled. Some of them were broken.
- Kirensk (491 km, 131). Shocks lasted for 45 minutes. Windows rattled. Weak swing.
- Nizshne-Zaimskoye (484 km, 168). Furniture and utensils fell.
- Karelino (463 km, 135). Strong jolts and quakes. Windows broken.

According to the meteorite interpretation the earthquake source was air-shock wave of the meteorite explosion i.e. its dimensions were small compared with the distances (short-term point-like source). According to this assumption, the Richter magnitude of the earthquake (M=4.5-5) and the time of the origin (00.14 UT June 30) were calculated from a few seismic station recordings [14,15].

But such earthquake could be felt just within the radius of 100 to 200 km as a weak swinging of the ground, not as shocks or shivering up to 1000 km away [5]! It can't be the cause of objects falling in houses at 600 km and further!

The long duration of the seismic phenomena is also a puzzle for the meteorite interpretation. At some places reliable observers reported duration of tens of minutes (up to 45 minutes). The Irkutsk seismostation recorded it for an hour an a half, while the author's investigation revealed that even many high amplitude earthquakes were recorded by it for as short time as 20 minutes.

Interestingly, there is a report from the Stepanovskii mine, a short distance from the town of Yuzhno-Yeniseisk, that an earthquake struck this area at 23.43 UT June 29, i.e. a half hour before the "fall of the Tunguska meteorite" [5].

2.5. THE CHEMICAL TRACES

No any "Tunguska meteorite" fragments were discovered. And many years ago it was proposed that the meteorite completely burn out into dust. Recently the attempt was done to calculate the burn-out [7,17]. In the author opinion this attempt can't explain the absence of the fragments, because:

a)Even the results of [7,17] conclude that it must be a lot of small fragments a few kilometres from the epicenter. As already mentioned, despite many years of careful search - no one found. And no large quantity of extraterrestrial dust (droplets) was found in the epicentral area. The results of a search for globally dispersed the meteorite dust also are negative [18].

b)In [7,17] the opacity of the meteoroid dust and vapours are neglected [19]. It leads to overestimation of the ablation rate [19]. Below the author tries to demonstrate that the overestimation is very large.

In [7,17] it is proposed that the meteorite disintegrated due to aerodynamic loads and formed a swarm of fragments. The fragments are ablated due to radiation flux from the shock wave (an absorption is neglected) which envelopes the swarm. According to the calculations the average time of the fragment's burn out is about 0.1-0.2 s [17]. It is about the time, which takes the swarm of fragments to slow down to a speed at which the ablation disappears. So even despite the fact that in [7,17] the heat of ablation was taken 2 kJ/g - the minimum one, the conclusion about the burn out is "at the edge".

But now let's take into account absorption in the fragments. The fragments in the outer layers would shadow (screen) the inner ones from the radiation of the shock wave. If the radius of the meteorite before its disintegration was Rm =30 m [7], the radius of the swarm of the fragments is about Rs =200 m [7], the average radius of the fragments Rf =0.03 m [7], we can evaluate the absorption coefficient due to screening

$$k = PI * Rf^{(2)} * N,$$

where N is the average number of the fragments per volume. As the meteorite with radius Rm disintegrates into the swarm with radius Rs, it leads to

$$N = 3 * Rm^{(3)} / (4 * PI * Rf^{(3)} * Rs^{(3)}).$$

So the optical thickness of the swarm is (in a plane approximation, which can be used for the evaluation)

$$k * Rs = 3 * Rm^{(3)} / (4 * Rs^{(2)} * Rf).$$

For above-mentioned values the optical thickness is 17! Other words, the inner fragments are completely screened by the outer ones! If we also take into account the screening by the ablation's vapours, this conclusion become even much stronger. In [20] the optical properties of H-chondrite vapours were calculated. It is shown that the absorption coefficient k in vapours for the most intensive part of spectrum of the air-shock wave (at altitudes about 20 km) is in order of 100-1000 1/m. So in [20] it is concluded that taking into account the screening in vapours significantly decreases a rate of ablation for large meteorites. The author just can join this conclusion.

So the fragments in a swarm are practically completely screened, with the exception of the thin outer layer and the majority of the fragments must survive the entry.

But as the author already has mentioned, no the fragments were discovered. Moreover, although minor chemical anomalies were detected in the "impact place" [16], they hardly could be assigned to a cosmic body, because of their composition. The latter one doesn't resemble a chondritic meteorite, neither a comet (as even pristine ice-rich cometary material is supposed to have a chondritic complement of about 50 wt% [18]).

Moreover, the deuterium to hydrogen ratio (D/H) in the Tunguska "catastrophic" peat layer is less than in the adjacent ones (and, much less than in ocean water, of course), while the D/H ratio in all 3 researched comets (Halley, Hyakutake, and Hale-Bopp) is on contrary much larger than even in the adjacent peat layers.

And, anyway, the chemical anomalies quantity is too negligible against what might be expected.

The absence of discernable nitrate excess (produced by the "Tunguska meteoroid" during its descent) is also a problem for the meteorite interpretation [18].

And finally, one more puzzling fact. Chemically robust carbon particles (probably diamonds) were found near the epicenter [21,22]. Their composition leads to the conclusion of their terrestrial origin [21,22].

2.6. THE BIOLOGICAL CONSEQUENCES

Trees of the second post-explosion generation exhibited higher than normal growth rates in the woodland area devastated by the explosion [23]. In recent decades, the boundaries of the high growth rate zone were "drawing in" toward the eastern "trajectory". Here the frequency of genetic mutations among the young pine trees has increased 12-fold. Till now the meteorite interpretation doesn't explain it.

2.7. THE SKY GLOW

The unusual glow in the sky was first observed days before the event [23]. Beginning on June 23, 1908, atmospheric optical amonalies were observed in many places of Western Europe, the European part of Russia and Western Siberia. They gradually increased in intensity until June 29 and then reached a peak in the early morning of July 1st. These anomalies included an unprecedentedly active formation of mesospheric (noctilucent) clouds, bright "volcanic" twilights, disturbances in the normal motion of the Arago and Babinet neutral points, a possible increase in the emission

of the night sky, and unprecedentedly intense and long solar halos. Later on, after July 1, these effects decreased exponentially [23]. The area involved in these phenomena was limited by the Yenisey river in the East, by the Tashkent - Stavropol - Sevastopol - Bordeaux line in the South, and by the Atlantic coast in the West [23].
It's very hard (practically impossible) to explain it even by the comet dust, because:
a) Nobody saw the comet. If it even existed it must be very small. When the Earth crossed a trail of the large spectacular Halley comet in 1910, it produced practically no effect.
b) For a few days the trail must cover all the Earth around. But the glow was localized in the Europe and the west Siberia in general.
c) Comet dust must stay in the atmosphere for many weeks, while 'light nights' disappeared in a few days.
d) The enormous quantity of extraterrestrial dust (to produce the prominent sunlight scatter) must strongly influence on the atmospheric absorption. But no unusually large absorption in the atmosphere was detected on the days of the glow (see section 3.12).
e) The sky glow was also observed at rather low latitudes, where it couldn't be originated by the scattering of the sunlight by the dust at night.
It is just a small part of the meteorite interpretation problems. The supporters of the meteorite interpretation usually try to ignore them. For example, when you are talking about the incompatibility between eyewitness's accounts and the meteorite interpretation, they use to say that the eyewitnesses often confuse and so on. But on the other side, the whole idea about the meteorite is based just on the eyewitness's accounts about flying fiery body!

3. THE TECTONIC INTERPRETATION

All above-mentioned facts can be explained on the assumption that the Tunguska event was a manifestation of the tectonic (endogenic) energy. One of its manifestations is well-known - it is trembling of the ground i.e. an earthquake. But now let's look at some others.

3.1. LUMINOUS EFFECTS OF TECTONIC ACTIVITY

A surge in tectonic activity may produce various optical effects in the atmosphere: luminous columns, stripes, lightnings, flame, glowing sky, etc. Exploding "meteors" are among them.
Here is how the onset of an earthquake at the Russian town of Kola began on February 21, 1873. The weather was calm. Suddenly it became dark and then an enormous fireball of a dark crimson color appeared in the eastern sky and vanished in the west. At this time underground jolt occurred and the earthquake began which lasted for 5 minutes. It was so strong that the houses swung and utensils fell.
Another interesting example. The "meteor" flew at low altitude in a blast of wind over the Russian town of Chembar past midnight on January 4, 1886, exploding on the road out of the town with loud thunderclap. This explosion killed a horse. Later the survived driver (coachman) just could tell that fiery serpent came flying and killed the horse. About 15 minutes after the explosion an earthquake struck the town.
These exploding fireballs happen in connection with many earthquakes. Some of them are mentioned in [24]. Here is an example.
During the earthquake in the Tama Hills, Japan June 17, 1931 "a fireball rose in the sky and disappeared. A sound like "Bah..." was heard. The lower sky was coloured pink-red for some time after the disappearance of the light".
The author thinks that everybody who are well aware of the eyewitness accounts near the Tunguska epicenter marks the similarity between these phenomena.
And one more very important observation proving that such luminous phenomena can be something more than just simple "lights". During the South Hyuga, Japan earthquake November 2, 1931 [24] a fishing boat called the "Ikedamaru" was engaged in fishing on the sea about 50 km off Utiumi, a town on the coast of Hyuganada. Near the time of the earthquake the boat began to pitch so heavily all of a sudden that the crew thought she was near being capsized. At the same time, to the crew's consternation, a large pillar of fire shot up from the surface of the sea near the boat.
On April 22, 1974 immediately before the earthquake hit Kiangsu province in China, people saw a bright streak of light in the sky. Sparkling and glittering with the "lightnings" dancing across it, it proceeded from southwest to northeast. The spectacle went on for some 3-4 seconds. In another Chinese province, Liaoning, fiery columns and balls flashed up in the sky on February 4, 1975, and a "flame" shot up toward the sky at the time of the earthquake. The precursors of the Tangshang earthquake in the Chinese province of Hopeh on July 28, 1976, were revealing in a way. About a half hour before the disaster, a bright flickering light was spotted in the distance. Instantly it was transformed from red to silvery blue, and then lengthened into a blinding white strip that darted across the sky and went out immediately. The eyewitnesses had the impression of a nuclear explosion. At the time of the earthquake an engine driver saw a lightning in the form of 3 blinding light beams, which were followed by 3 mushroom-shaped smoke columns.
A very interesting luminous phenomenon was seen a night before aftershock M=5 of the 27 May, 1976 Lungling earthquake (China) [25]. Two Chinese seismologists observed a fireball about 50 metres in diameter 200 meters away. They watched the fireball for almost half an hour. Next morning at the fireball's site they found "an extensive remnant of a sand boil" [25]. Why not the Muong Nong type tektites production on mini-scale?

diameter. It then shot up to a height of 10 or 15 meters, whereupon the volume started shrinking, finally to ping-pong-ball size. After reaching the maximum height, the ball curved over in an arcuate trajectory, resembling a meteor and disappeared as it fell to the earth. The light would dim, then brighten again. Small wisps of white smoke swirled around the light, and a slight crackling sound was heard. A radio compass and telluric currents were unaffected. A small fuunnel-shaped hole in the ground was found at the place where the fireball appeared. In another case, a fireball started near a house, rose up along an arbor, and burned a hole in the roof of the house. A total of about 1000 fireballs were sighted, 50 in one evening. Chinese seismologists discovered that more fireballs occurred along intersections of river beds and faults [25].

In connection with the swarm of earthquakes in Quebec, Canada 1988-1989 a lot of lumonous phenomena were sighted: sparklings, dawn-like diffuse glow, aurora-like bands [26]. Fireballs a few meters in diameter often popped out of the ground in a repetitive manner at distances of up to only a few meters away from the observers. Others were seen several hundred meters up in the sky, stationary or moving. Some observers described dripping luminous droplets, rapidly disappearing a few meters under the stationary fireballs [26].

A very important results on the earthquake lights were recently obtained in relation with the 1995 Kobe earthquake. The investigation of the place where during the earthquake several "streaks of bluish-white color spread out for about a second" (for details see "Geophysical Research Letters v.25, p.2721 (1998)) revealed the traces of 1000 A electric current through the area of about 1000 sq. cm. (Dr. Y. Enomoto, personal communication (1998)).

It is important also to add that there are some signs of a relation between regional lightning and shallow earthquakes (see "Geophysical Journal International" v.131, p.485 (1997)). Remarkably, that during 19th century an idea was popular that earthquakes are of electric origin!

In general "tectonic lights" could be "meteors", pillars, rays, shooting up flame (usually in an epicenter), semispheres, fireball, patches and bands (in the sky and on the ground), all-sky luminosity, flashes, "auroras", sparks, "clouds", black objects and many others. They have some tendency to move towards an epicenter of an earthquake.

3.2. THE MAIN FEATURES OF THE TECTONIC EXPLOSIVE EVENTS

As we saw, many of these "lights" display energy release, sometimes explosion-like character. Usually these events happen in connection (prior, at the time or after) with earthquakes. But sometimes (see below) the accompanied earthquakes are very weak and an energy release by explosive event exceeds an earthquake one. In the author's opinion [27, 28] these explosive events are arranged in large volume of medium (at first, solid state: rock, soil) and one of their the most remarkable features are explosion-like effects with manifestations often not localized in the vicinity of the epicenter (also see below). So the author proposed to name them nonlocal natural explosions (NNE) [27,28].

Indeed, more and more data appears showing that geophysical medium (at first, soil, rock) is a complicated nonlinear active system possessing its own "memory". Such a medium is to be characterized by self-organizing and self-adjusting processes in it. Possibly that NNE are just one of the way of such self-organization [27].

It is remarkable that NNE (as well as luminous phenomena) rather often occur at certain places and very seldom in others (it seems that such NNE-areas often don't coincide with areas of increased seismicity, but lie close to them).

Till now we don't know their physical mechanism. The author doubts that it could be explained just by electromagnetism, at least by known forms. Probably we must add something. Maybe just this self-organization? The author have an impression that NNE are just "the top of an iceberg" (one of the most clear manifestations) of some universal fundamental process (of self-organization?)[27,28].

Anyway, NNEs are real and, in general, probably, we can describe NNE events as a high-rate release of energy from a geophysical medium (a solid state substance (soil, rock) is just the best example, probably), which manifests itself as mechanical and other actions not caused by direct mechanical influence of substance movement (ground oscillations). This definition has its shortcomings, but the author can't propose a much better one now.

In typical cases NNE looks like an appearance of luminous body (sometimes it could be dark and probably even invisible) which travels to some site (or originate at the site). Then it explodes (NNE itself takes place).

Unfortunately, a number of known high-energy NNE, which aren't connected with large earthquakes a rather small, so features of NNE (below) are just preliminary and must be proved later:

- NNE gravitate towards geological inhomogeneity, heterogeneity and discontinuity (tectonic faults, circular structures, intrusions, ore deposits, etc.);
- The NNE global geographical distribution reveals its gravitation to so called "astrobleme belts". It hints that NNE are a part of some global processes.
- NNE tend to happen at the time of increased solar activity (flares?);
- There is some suspicion that NNE tend to occur about 02-05 h sidereal time and 14-17 h, i.e. 12 h later (it's interesting to note a resemblance with unexplained disturbances of gravitation detector network [7]).
- NNE tend to happen at about a new Moon and about a full Moon (often a few days later of a full Moon).
- NNE tend to occur in connection of weather breaks, often followed by thunderstorms. It is interesting to note a resemblance with 'earthquake lights' which tend to happen during cold front passages, i.e. also preceeding appearances of thunderstorms (see section 3.12).

If proved. some of above-mentioned properties indicate that NNE is closely connected with unknown interaction between the Earth (the Earth's interior at first) and Space.

NNEs often resemble (look like) explosions of ball lightnings. So in many cases we could say that it was the explosion of the ball lightning endogenic (tectonic) origin. Who knows, maybe NNE could help better understand when and where better try to create artificial ball lightning in a laboratory?
In any case, NNEs exist, and could explain some famous hard-to-explain events.

3.3. EXAMPLES OF NNE

Below are several NNE examples.

- **THE SASOVO EVENTS** were described in [27,28]. In April 12, 1991 a strange explosion took place near Russian town of Sasovo (350 km to the south-east of Moscow). After the explosion a crater dia. about 30 m and depth 3 m was found. For some years before the explosions there were signs of increased tectonic activity in the region: a great number of "fireballs" and so called UFO-s, evidences of ground slow deformation and so on. For about several hours before the 1991 explosion in many places people saw numerous "fireballs", often accompanied by rumble and even ground vibrations. In many houses animals began to be anxious. Some people felt bad. Railroad radiocommunication device failed. In about 1 minute before the explosion in broadcasting radio receiver a noise appeared, which soon jammed all radiostations. At the distance up to several kilometers from epicenter some people said that they felt "heat wave" and suffocation. Near epicenter - bright flash with duration several seconds and explosion (thunder with ground shock) took place (according to some reports at first "glowing object" flew down to the site). Probably light phenomena were present in some other places.

The 1991 Sasovo explosion was accompanied a by number of intriguing phenomena, sometimes resembling a (ball) lightning and even a tornado damage. There was some unusual and selective damage in the town and even in the village 20 km from epicenter. The azimuth distribution of hurled frozen soil from the crater and the damage has 4 lobes. But, on the other side, the small tree in about 10 m from the epicenter was undamaged. There were no damage on the ground level at distance up to about 1 km from the crater (only ground swing and jerking). At large distances there was unusual damage on the ground level and even water-pipes at distances up to 15 km from epicenter were torn off. During the explosion in closed and undamaged rooms in much cases different things flew with soft landings and even several persons were transported by unknown force. Hollow plastic toys and electric lamp bulbs exploded. At the distance about 10 km from the main crater two more pits in the ground appeared that night. Soil was hurled and there were accompanied light phenomena.
In the mid-1992 the second cratering explosion happened in sparsely populated area in about 8 km from the first one. The crater diameter was 11 m and depth was 4 m. In the crater soot-like film cover was present. Unfortunately, a little is known about the crater's appearance.
At the end of 1992 an instrumental research established the following. A decrease in the magnetic field reached 100 nT in the 1991 crater and 30 nT in the 1992 crater was recorded. The gravimetric survey with regard to a mass deficiency inside the craters indicated elevated values of gravity with fluctuating amplitudes up to 100-150 microGal for the 1991 crater and 100 microGal for the 1992 crater. Seismic monitoring for 2 weeks in the vicinity of Sasovo recorded not less then 2 small earthquakes endogenic origin.
A tectonic fault is passing through the region.

- **THE PETROZAVODSK EVENT**. Another example, which also looks like mini-Tunguska is the event near the Russian town of Petrozavadsk in 1990. It was investigated by the Siberian geologist Sal'nikov V. N..

On March 29, at 4 a.m. the eyewitness suddenly felt a headache. He turned to the window, saw a flash of light, and heard "a clap". A formation in the form of straw-white-colored cylinder rose above the forest and flew into clouds. The air over the forest was filled with a smoke, and then it rained.
In the autumn a forest fall 30 m by 25 m size was found in a marshy area. The trees were uprooted there with its tops away the epicenter, forming a spiral with two branches. The rind of some trees was burned forming vertical stripes. The roots of trees were burned in a form of concentric bands. A part of the roots was charred from above and sometimes under rind (which, however, remained unaltered). The outer part of the spiral was characterized not only by burning trees, but also by concentric scorched circles around the standing trees.
The author is aware also of findings of unexplained radial (sometimes fan-like) forest-falls at different places of the world.

- **THE JANUARY 23, 1974 EVENT IN THE NORTHERN MID-WALES (UK)**. It was described in [29] as the unexplained one. Near a mountain Arthur's Table a tremor was felt. Seismic recordings revealed that it was "unusually large magnitude". There were reports of an explosion being heard simultaneously with the tremor. It was heard over a radius of tens of miles. Before and after this event, curious fireballs were seen, both in the vicinity of Arthur's Table and nationwide. It seems that a white fireball was seen over the Isle of Man to the north, multi-colored balls of light were seen over the Bristol Channel to the south. A blue fireball was seen over East Anglia. It was speeding westwards towards Wales and in Coventry the westward course was confirmed.

The extraordinary sequence of events made leading news items that evening and the following day. At first it was proposed that a giant meteorite fell in UK near Arthur's Table. But the following research didn't find any traces of the fall. Quietly, the item slipped from the news as it became apparent that the experts would be unable to find an explanation.
In [29] it is also mentioned that Arthur's Table is on Bala fault. The author discovered in [30] this earthquake. Its origin time was 20.38 UT and the position 52.7 N; 3.7 W. The depth was 33 km (i.e. uncertain) or 0 km. Totally it was recorded by 29 seismostations. One seismostation recorded dilatational first motion of seismic wave (i.e. motion toward

epicenter), while a meteorite fall could produce only compressional (i.e. motion away from the epicenter) one.
Moreover, an another earthquake happened in 1993 a few tens kilometers from this one.

- **THE APRIL 2, 1978 BELL ISLAND EVENT, CANADA**. The data on this event, including photocopies of newspapers clippings was sent to the author by R. Spalding, Sandia Nat. Lab. (USA).

It was first described as an unidentified atmospheric explosion and sounded similar to the booms that have been heard in those years along the coast of Nova Scotia and New England.
It was a fairly fine day with just a light snow falling on Bell Island. A little bit later 11 a.m. local time a local resident saw a straight beam of white light coming down from the sky at a 45 degree angle to the ground. The glow was not strong, accompanied with a low noise and there was a strong thunderclap at the end of it. The thunderclap was heard more than 100 km away.
One witness said she heard 3 blasts and the ground shook with each blast. Another witness said that he heard another weaker blast a few hours after. The electric power in the houses went out just before the first explosion.
People on the mainland shore of Conception Bay reported seeing fireballs coming down out of the sky and hitting Bell Island. Four miles from Bell Island across open water, said there were streaks of super bright silvery bright light.
In result of the event one house was damaged, especially its electric devices. Nearby a small shed and electric transformer were struck also. Futher away a barn with attached henhouse were damaged. The henhouse was virtually destroyed, a wall smashed in and the roof torn off. Five hens were killed. Nearby 3 circular holes in the snow appeared, under the branches of a thin lir tree, which was scorched black about 5 feet high. A couple of other trees were also slightly scorched. The holes formed a triangle. The biggest hole was 4 feet deep and 3 feet wide. Fused material was present at bottoms of the holes.
All over Bell Island there was a momentary loss of electric power during the event, which soon has recovered, with the exception of a few houses in the vicinity of the incident.
Initially 2 main interpretations (a lightning strike and a meteorite fall) were put forward. At first local meteorologists confirmed that there was no thunderstorm activity in that area at the time, but it was snowing. But later the meteorologists have concluded that atmospheric conditions were in fact of a "thunderstorm nature" (to tell the truth, the author doesn't know what does it mean), so the idea about very powerful lightning (probably a ball lightning) became more popular, as no meteorite traces were discovered.
Remarkably that Bell Island contains one of the richest iron ore bodies in the world.

- **THE JANUARY 29, 1986 EVENT IN THE TOWN OF DAL`NEGORSK, RUSSIA**. Possibly it is still the most investigated such event. The following description is based on the research by Dvuzshil`ny V.V. (a member of the commission on meteorites Acad. of Sci. USSR), Sal`nikov V.N. et al..

At 19.55 local time a red fireball was seen over the town of Dal`negorsk, Russian Far East. It flew silently parallel to the ground surface with the speed of 15 m/s leaving no wake neither trail. After the fireball have passed the town, it 'dived' to the slope of the small mountain (the height 611m), then jumped up and down 6 times above the mountain surface. It was accompanied with a very bright light persisted for an hour. One eyewitness said that after it, the fireball took off and flew away.
The 'impact' site was researched 2 days after. The fireball destroyed about 2-3 cub. m of the rock. The site was covered with singed pieces of the rock with small metallic spherules sprinkled. At the edge of the site there was a burnt tree-stump.
Even in 1989 a strange 'field' existed in the site. Living organisms avoided the site. It negatively influenced on human health. Radio-electronic devices and photo-cameras used to malfunction in the site. For example, the photo-images often were absent while taken at the site, and when taken outside the site they were of good quality.
Three main types of remnants were found at the site. Pb-spherules (about 60 g.), Fe-spherules (about 15 g.) and 'sponge'.
The Pb-spherules consisted of Pb with a small percentage of other elements like rare-Earth ones. Dimensions - upto 4 mm.
The Fe-spherules were 2-4 mm in diametre and consisted of Fe with C and O and a small percentage of Cr, Co, W. The Fe-spherules were magnetized.
'Sponge' was a glass-like substance covered with a lot of 'holes'. Silicon 'threads' about 17 microns width with a gold 'thread' inside were discovered. The 'sponge' probably was remnants of rocks and the tree-stump in general.
The singed pieces of the rock were dehydrated and enriched in oxides of various metals. The silicon contents was slightly lowered.
The trajectory of the fireball was parallel of 2 faults and the 'impact' site was in the intersection of several faults.
In the evening of Febr. 8, 1986 two fireballs were seen near this mountain. They flew around the mountain 4 times and then flew away.
On Nov. 28, 1987 totally 32 fireballs flew over the Russian Far East region. Four of them flew over the mountain, three ones were above the town of Dal`negorsk and five ones illuminated environs.
Statistical analysis revealed that the 'fireballs' tend to appear above faults and ore deposits during a full Moon.

- **THE MAY 28, 1993 BANJAWARN EVENT** happened in the remote area of the golden mineralization in the Western Australia. The information on the event was sent the author by Australian geologist/geophysicist Dr. Harry Mason [31], who also kindly answered some the author's questions. Here is the description [31].

At 23 hours local time (15 UT) a large orange red spherical "fireball" with a very small bluish white conical tail had flown from low down in the south over observers travelling to the north. Some observers reported that the fireball was cylindrical in form and more yellow-blue-white in colour. It was heard as a pulsed roaring or loud diesel engine sound -

well before it arrived, it dropped off no glowing fragments, and had no long luminous tail or sparks - as is common meteor activity. Its speed was similar to a 747 jet liner or a fast jet plane.
No sonic booms were reported, and no observer believed that any explosion was heard until the "object" got to ground level - or very nearly so (behind low hills or tree line cover) - and exploded/or impacted.
It flew apparently parallel to the Earth's curvature in a long "nap of the Earth" arcing trajectory at low altitude (some 1-2000 metres ?) from low down on the southern horizon, not with a "normal" meteor inbound high angle high altitude trajectory. The fireball lit up some observers and their vicinity as it passed overhead. It's flight trajectory was observed over a distance of least 250 km. It then appeared to arc down towards the ground and disappeared out of sight behind trees or low hills.
This was followed after a 5-minutes delay by a near blinding massive high energy burst of blue-white light that rippled for about 3-5 seconds. It lit up the night (windless, cloudless, and moonless) sky as if daylight. The energy intensity involved in this light flash was similar to the light flash generated by a significant nuclear blast, and in many respects the incident strongly resembled a night time nuclear test.
A huge red coloured flare then shot vertically skywards for some considerable distance (several kilometres ?), and this was immediately followed by a massive seismic ground wave that hit the observers nearest to "ground zero" such that rocks and beer cans vibrated off of tables and the ground shook violently so that persons tending a camp fire fell over. At the small gold mine (the Alycia Mine) underground 7.5 cm steel pipes sheared clean in half and collapsed underground drives and shafts.
A very loud major explosive blast then followed that was heard over a 250 km by 150 km corridor, minor quake damage was reported as far as 150 km southeast of the "ground zero" - the other directions (excepting Leonora to the southwest) being largely uninhabited.
A large deep red-orange coloured hemisphere of opaque light with a silver outer shell lining then rose from ground level to hover around over the "ground zero location". This structure when fully developed was approximately three times the size of a typical Goldfields setting Moon as seen by observers located 30-50km from it - (i.e. it was very big), and it bobbed around a bit for nearly two hours, before disappearing suddenly.
This "half soup plate structure " (looking like a "deep red very large and half set Sun") was seen by two observers from widely separated locations, one at the Banjawarn station buildings, and one at the Deleta station buildings.
Almost exactly one hour after the first big event three observers (located at the Banjawarn station buildings) also saw a second much smaller fireball - more blue-green-white in colour, which appeared to rise from ground level (?), but which definitely rose from behind distant trees well south of the station perimeter, and flew to the north in a high mortar shell type arc before coming down to ground level, behind distant bush. It's flight path was divergent to the north northeast when compared to that of the first major "fireball" event of that night.
This later event then created a second but very small explosion and concomitant minor ground shake - similar to the first event, but much smaller in size, and with no resultant rising hemisphere of opaque light. This second event does not appear to have been of a magnitude sufficient to register on A.G.S.O. seismographs.
Next morning nothing unusual was seen from the hills nearby.
In 1995 Dr. H. Mason spent a considerable time in a airplane, but failed to find any crater or ground anomaly of any kind there or anywhere else in a 300 km diameter search area. Ground and air examination of the nearby Celia fault-lineament could find no evidence of any movement on this structure.
At about the same time Dr. H. Mason got a report by the three truckies seeing yet another fireball soon after starting work at 5.00 a.m. (exact date unknown) in May or June of 1993. Their "moon sized" fireball flew from south to north at low level (some 1000 metres) with a high speed jet plane velocity. It was yellow-orange-red in colour and had a very small blue-white tail, and lit up the early morning dark sky in an intense blue white light flash that silhouetted the countryside, as it too headed immediately west of Laverton directly for Banjawarn station. As they were sitting next to loud diesel engines of their own we do not know if this third Banjawarn fireball made any pulsed roaring noise. This third fireball held a course that, would pass over Banjawarn.
As Dr. H. Mason have informed the author, the 95% of eyewitnesses of lumminous phenomena and seismic effects gave the epicenter at 121 deg 10 min East, 27 deg 05 min South. The distance from the Celia Lineament is 10-15 km on harmonic parallel linear. The rest 5% of eyewitnesses (just seismic effects) and the seismic monitoring network gave the epicenter a several dozens km to the south, right on the Celia Lineament, where it crosses with another fault. It is interesting to note, that the Laverton town water supply pumping station is quite close to the latter epicenter and there was a drought at that time, while several following years there was enormous flooding. In 1994 there were a few reports from the region of the "luminous epicenter" about strange 'explosive' sounds accompanied with minor seismic effects (in the author opinion - brontides, probably). Moreover, two other large orange-red hemisphere static light form structures have also been observed at night northwest of Banjawarn (in 1988 and in October 1992).
As the author found in the "Bull. of the Intern. Seismol. Centre", the focus depth of the earthquake was 1 km (according to H. Mason, the quake is calculated as negative in depth i.e. up in the air) and magnitude M=3.6, according to the Australian seismostations. One seismostation recorded compressional first wave motion, while another recorded the dilatational one (this fact alone is enough to exclude a meteorite fall as a possible origin).
Dr. H. Mason takes into account 5 possible origin of the event. He admits that is it unknown natural event, but, rejects 'earthquake lights', because, as he writes "of their usually very low energy output". But as he discovered strong correlation of this and other similar events in Australia (see below) with geology (tectonic faults) and earthquakes, he is

supposing that the most probable it was the experiment with electromagnetic weapon for inducing earthquakes conducted by Russians or Americans!
Here the author would like to attract attention at one interesting aspect of the event. A surface explosion of about 500-1000 t TNT produces an earthquake of magnitude 3.6 (and a crater about 200 m in diameter). As no crater were found, it could be proposed that the explosion was aerial (if to ignore the given focal depth of 1 km), but it increases TNT equivalent at several orders of magnitude. But there were no reports or any signs of strongest air-shock waves produced by such powerful explosion. So we should conclude that the explosion and the seismic phenomena have another, much more tighter coupling mechanism than just shock-air waves (see also below).
The author have many arguments that the event was not such the weapon experiment and, of course, not a 'meteorite'(see: "Science News", June 7 (1997), p.359), but already known to us NNE, in some way a "powerful" kind of 'earthquake lights'.

- **THE MAY 1, 1995 PERTH EVENT**. This event happened over the largest Australian city Perth. It was investigated by Dr H. Mason and described in [31]. Again we follow his description [31]. Unfortunately, the author haven't enough data to guarantee that it was NNE, he can just say that it was probably NNE.

At about 2 a.m. local time (18 h. UT, April 30) a large spherical orange-red fireball with a small conical blue-white tail was observed flying from the Indian Ocean over Bunbury in the Western Australia in a north northeasterly direction at a relatively high altitude, apparently flying a trajectory that was parallel to the earth's curvature. The altitude of this fireball is open to question as many observers thought that it was not too high in the sky but newspaper reports later placed it at several kilometres altitude.
The fireball soon arrived above the eastern side of the City of Perth, and was seen and heard by many eye-witnesses over it's 150 km land flight trajectory. Observers reported that the "object" emitted a loud roaring pulsed noise - similar to a diesel freight train - before it arrived - and that it flew at a steady speed similar to a high speed jet aircraft. There was no report of a sonic boom.
Whilst opposite the eastern side of Perth near Midland the fireball reportedly stopped dead in the sky and the tail inverted through the fireball to point towards the previous direction of travel.
There was then an enormous burst of blue-white arcing light energy that lit up the city and it's suburbs for many kilometres - briefly as clear as daylight - similar in many ways to that of a nuclear blast. A loud vibrating massive explosion cum seismic wave reverberated around Perth and the city buildings shook whilst books and objects fell off of shelves.
Several observers reported that at the instant of the explosion four white lights raced apart from the main "object's" centre forming a right angle white cross in the sky. No object was actually seen at any time - just a bright orange-red fireball of light emission and it's very small blue-white light conical tail.
One observer reportedly told the Perth Astronomical Observatory of seeing sparks drop off of the fireball during it's flight and that it had a long tail or streak of orange colour. All other Police and Public eye-witnesses reported the fireball as having no, or at best a rudimentary very short, tail, and they definitely saw no sparks, noting that it was spherical or cylindrical in form as defined by light energy emission.
About half of the city's population was woken up by the violence of this explosive and seismic wave event. The ground vibration wave was picked up by the A.G.S.O. Mundaring Seismic observatory as a paper analogue recording lasting some two minutes timed at 17.57 UT i.e. commencing at 1.57 a.m. local time.
This event raised some discussion in the press over the next few weeks and was generally explained in the media by the Perth Astronomical Observatory as the explosion of a meteor fireball with a power of one or more mega-tonnes of TNT equivalent, at an altitude of several (20 km ?) kilometres. Surprisingly this event was not apparently widely reported in the World press.
Reports soon came in of small lights and strange aerial noises that had moved to the north northeast of Perth towards the small town of Toodyay (about 70 km to the north-east of Perth) and beyond, on the night in question. Amateur meteor astronomers spent a considerable amount of time interviewing farmers out that way but no meteor fragments have been recovered at least to the date when Dr H. Mason was writing the article [31], i.e. December 1996.
Later reports noted that on the same night, some 1900 km to the north- north east of Perth, a couple situated on Sunday Island, north of Broome, in the Kimberley region of the Western Australia, were woken some time around 3.00 a.m. local time by a loud roaring pulsed diesel engine noise - similar to a D9 bulldozer or tank engine - advancing directly towards their front door. This noise rose to a crescendo and books and objects fell from their shelves. The seismic ground vibration wave and sound event lasted for some 1-2 minutes. Believing they had experienced an earthquake the family listened to the early morning ABC radio, but the only story was of the explosive meteor fireball event above Perth. A check of the Mundaring seismic records has shown that no earthquakes of any magnitude at all occurred at Sunday Island or anywhere else in their region that night.
And again Dr H. Mason inclines to think that it was electromagnetic weapon experiment! The author don't touch here his idea, just marks, why hardly it could be a meteorite.
1) Its flight and trajectory don't conform the meteoritic one.
2) It didn't look like a meteorite.
3) Its roaring sound and absence of sonic boom are hard to explain by a meteorite fall.
4) Its explosion looked like an explosion of a ball lightning, but not a meteorite.
5) Let's compare the seismic effects of its explosion with the seismic effects of the explosion of the real St-Robert meteorite June 15, 1994 near Montreal, Canada [32]. During this meteorite explosion at 36-33 km height, its mass was

about 1200 kg, and it transferred to the acoustical energy equivalent of about 500 t TNT. Windows rattled, and skyscrapers swung, but the amplitude of the ground vibrations was very small - just 4 nm [32]! Other words, the above-mentioned 'seismic' effects were produced by air waves, not by a quaking of the ground. The characteristic 'sign' of air wave actions on buildings - the superiority of 'external' disturbance over 'internal' quaking. It means, for example, that windows could rattle and be broken, but bottles in a refrigerator don't fell. A good example of the air-wave action is the destructions in a settlement 400 km away (a region of a focus of blast air-waves reflected from the ionosphere) from the 1961 Soviet 58 Mgt nuclear blast at 4 km height. Wood houses were destroyed, at stone ones roofs, doors and windows were absent (blown away).

In the Perth event we see considerable 'internal' seismic effects, with no report on 'external' damage (mass broken windows, roofs etc.). So it could be stated that there was another origin of seismic effects besides air-waves, as well as at the 1993 Banjawarn event.

6) After the explosion of the St-Robert meteorite at 36-33 km height more than 25 kg of its 1200 kg mass were found [32]. But as the hypothetical Perth meteorite is expected (from the comparison of the explosions energies) to be hundreds-thousands times larger and the explosion height even lower, the absence of any recovered debris looks very astonishing.

7) It is very remarkable that the Perth fireball whole 150 km long land flight trajectory and the explosion site are exactly over the Darvin tectonic fault, where small earthquakes occur from time-to-time.

As a conclusion, it could be stated that the 1995 Perth event reveals many signs of NNE.

- **THE JANUARY 14, 1993 JERZMANOWICE (POLAND) EVENT**. The information on this event was sent the author by Dr Ceplecha Z. from Astronomical Institute Academy of Sciences of the Czech Republic. A lot of materials on this event also could be found in the Polish "Przeglad Geofizycny", Vol. XL, (1995), No. 4, pp. 335-407 (Komitet Geofizyki Polskej Akademii Nauk).

A bolide was seen (and a sky was very bright) followed by a huge electric discharge and also some seismographic records. The event happened in Poland near Cracow (Babia Skala, Jerzmanowice) on January 14, 1993. A good part of the "Babia Skala" limestone crag was thrown to distances of over 200 m, and the largest piece was of more than 100 kg (80 m apart from the stroke). Sinuous or zigzagging furrows radiating away and bifurcating were carved in the grass-cover soil surface within 50 m from the detachment point on the crag. Electric wiring in the village was melted.

This event was connected with three discharges, which were practically straight-line discharges. The first one was the largest (at 17h 58min 53.9s UT, timing from the seismic records), and proved to be about 17 degrees (+- 10 degrees) inclined to horizon, very shallow. It started at a height of 2.05 km (+-065 km), longitude 19,693 +-0.014 deg, latitude 50.183 +-0.004 deg, and terminated exactly at longitude 19.756 deg, latitude 50.207, height 0.48 km. It was 5.5 +-1.2 km long. The second discharge happened at 18h 00min 16.4s UT and the third one at 18h 01min 43.3s UT.

The author can add that the site of the event is the site where weak small-focus-depth earthquakes happen from time-to-time and a cold front (which was passing the area) is also favourable for 'earthquake lights' activity.

- **THE JANUARY 18, 1994 CANDO (SPAIN) EVENT**. The information on this event also was sent the author by Dr Ceplecha Z.. More detailed information is published in the "Meteoritics and Planetaty Science" (v.33, p.57 (1998)) article by Docobo J.A., Spalding R.E., Ceplecha Z. et al..

In the clear dawn of January 18, 1994 a bit before 7h 15min UT many people in Santiago de Compostela witnessed a very bright luminous object crossing the sky in a descending trajectory (according to some reports, at a certain point of the trajectory the descent changed to a sharp fall). It was described as a fireball with a small red-orange tail with apparent angular size. A surface crater in Cando (8.864 deg. W, 42.843 deg. N) with dimensions 29 m by 13 m and 1.5 deep was later discovered near the projected "impact" point of the luminous object. At this side, in addition to the topsoil, full-grown pine trees more than 20 meters high were thrown downhill over 90 m away. No meteorites were discovered.

The author can add that the site of the event is the site where weak small focus depth earthquakes happen from time-to-time.

- **THE NOVEMBER 22, 1996 HONDURAN EVENT**. The information on this event was obtained by the author from contacts with its researchers. A description of the event by astronomer J. Borovicka could be found at Web-site http://www.astro.cz/people/borovic/honduras.htm.

In the clear evening of Nov.22, 1996 at the large area of the Western Honduras there were a lot of luminous phenomena, accompanied by sounds and ground trembling. Immediately after the event the Moon became dark and the night became foggy/cloudy. Some people reported smelling sulfur. Also at some places coffee plants faded away, the water became bad, many people became ill, some fissures were discovered on the ground, several landslides took place at about these times.

Here are some examples of the luminous phenomena: very bright fireball followed by loud concussions 2-3 seconds later; the sky split and fire came down; bright diffuse light; string of pearls; a group of stars crossing the sky; a rotating object with curved trajectory; an object moving in zigzag; a red clearness.

A remarkable phenomenon took place in El Progresso town about 8 hours before the event. A small stone fell on the ground. The stone was retrieved from the yard while still warm. It was spinning and de-gassing (with strong smell of sulfur) after digging itself into a small crater. The stone was red-hot, about 4 cm in diameter, and turn black on cooling. After a few days the fragment had disintegrated into gray ash. Approximately 2 minutes before the fall a bright fireball was seen high in the sky. The author would like to attract attention to this phenomenon, because it resembles (in smaller

scale) some Evenks accounts of stone falling at the Tunguska times. They resemble the famous (and still unexplained) 1855 Igast episode (see "Nature" v.209, p.67 (1966)) and some others.
Several international expeditions searched for the meteorites, but no meteorites were discovered.
Besides a connection with the weather change, the author would like to attract attention also to a remarkable coincidence of the event with solar activity. While the solar activity was very low at that period in average, there was a short-term upsurge of it right at the time of the event.

- **THE JUNE 1997 HUDSON BAY EVENT**. The information on this event was obtained by the author from the Canadian magazine " The Nation" and from contacts with its researcher Alex Roslin.

It took place at about 55.5 N, 77.5 W on June 27. The sky turned black, thunder and lightning struck. Through the clouds came the fireball. It disappeared behind the horizon, then the fireball struck with a loud bang and flash. The hunters were the closest witnesses to the impact of the fireball. When they returned home, a new bay had been carved out of the shoreline. The whole area affected had about a quarter-mile radius. Geologists proposed that it was just a landslide of the shore. But it didn't conform with the debris found 3 miles out on an ice floe, and a bus-sized crater discovered in the water. Moreover, soon reports appeared about fireballs at other dates. For exapmle, a fireball was seen speeding towards the site in the evening June 22. There were also reports of 2 separate tremours at the time. A seismic station 210 km away recorded a disturbance in the evening of June 22. Geologists were stumped by the cause of the tremours, but said weather is probably responsible. In total, fireballs were seen on 4 different days: June 22, 24, 27 and July 4. Some local residents said that similar event took place in years gone by. As usually after large initial interest (a large meteorite fall!), it is now almost forgotten, as many other events, which don't conform popular explanations (a meteorite fall, a landslide, etc).
To finish the examination of certain NNE events, the author would like to mention that anomalous sounds, described as gun shots etc. and sometimes accompanied by small tremors are well-known from many places of the world (including the West Australia, where they were heard, for example, on June 26, 1908 [33]). They are usually called "Barisal guns" or "brontides" [34] and, as a rule, are reported to be heard at the places of increased tectonic activity (which often doesn't manifest itself through strong earthquakes). Sometimes strong whirlwinds and other forms of wind actions appear with these sounds. Some authors incline to think that the sounds precede a bad weather. There is a report that the site where these sounds used to come from resembled a site which was struck many times by lightnings. The author thinks that brontides are caused by NNE (recently he was surprised to discover that as long ago as in 1896 the proposal was published that Barisal guns and other natural booming sounds are likely due to ball lightning explosions!).
Till the end of the 18-th century the general scientific opinion was that all fireballs are terrestrial origin. Soon after the pendulum swung in the opposite direction. In the author opinion, the truth is, as usually, in-between.
Let's return to the 1908 Tunguska.

3.4. THE TECTONIC ACTIVITY AT THE SITE AND THE TIME OF THE TUNGUSKA

Now the author try to demonstrate that the increase of tectonic activity is expected at the site and the time of the Tunguska.
At first, the Tunguska occurred the place of the most powerful volcanic activity in the Earth history 250 millions years ago. The Tunguska explosion epicenter is right in the middle of the ancient volcanic crater, which after its discovery in 1972 got the name "Kulikovskii". This volcano is a part of Khushminskii tectono-volcanic complex [35]. The prominent Beryozovsko-Vanavarskii tectonic fault is passing through this structure. At about 70 km to the east of the epicenter there is the centre of the Vanavara circle structure, where several prominent tectonic faults intersect. Unique Tungusskaya and Lepchinskaya paleovolcanic superstructures are near [35]. This region was a "hotspot" [36]. The upper mantle in the Tunguska event region has anomalous high speeds of seismic waves [37].
There are many prominent tectonic faults, circular structures and other geological formations in the region (see FIGURE1). Many of these tectonic faults are no older than of the Neogene age [38]. Several prominent tectonic faults are intersecting near the Tunguska explosion epicenter.
The southern border of the Tunguska event manifestation is the Lake Baikal rift. This rift is a place of high tectonic and seismic activity.
At least, during last century and at the beginning of 20-th, there were many reports about seismic activity in the middle of the Tunguska event region (about the latitude of Kirensk town) [39]. The author also found a couple reports about earthquakes from the northern part of the Tunguska event region in the middle of 19-th century [5].
There are signs of increased tectonic activity during the time of the Tunguska. For example, in 1908 ten observer's reports on seismic events came from the Lake Baikal region. In the next few years, their number dwindled abruptly (1 - in 1909, 2 - in 1910), no shocks having been registered in 1911 [39].
The distribution of the reports on seismic events inside the year 1908 is also remarkable. On FIGURE2 there are the reports on earthquakes in the Lake Baikal region from the spring to the fall of 1908 [39].
It is seen that the seismic events are concentrated near the Tunguska date, June 30. It is also notable to mention the July 1908 message by the Tomsk's student Bryukhanov A. to the director of the Irkutsk magnetic-meteorological observatory, in which Bryukhanov wrote about unusual event near Ust'-Kut settlement (513 km, 152) - the appearance in the 1908 summer of a hot spring with various chemical elements presented. It didn't exist before.
So there are evidences of the activation of tectonic processes at the place and at the time of the Tunguska.

Moreover the author's analysis reveals activation of tectonic processes at the Tunguska times not only in the Lake Baikal rift and the southern part of the Siberian platform but also on more large (global?) scale. The evidences are following.

- The author searched through the data on the position of the Earth axis of rotation, given in [40], together with the 'momentary' polhode radius of the Earth axis trajectory on the Earth surface (i.e. in plain language, the trajectory of the North Pole). The data in [40] is given with the interval (step) of 0.05 year. It was revealed that between 1908.35 (i.e. May 8) and 1908.40 (i.e. May 26) the strong increase of the polhode radius took place. Then, between 1908.40 and 1908.45 (i.e. June 14) it stabilized. And finally from 1908.45 to 1908.50 (i.e. July 2) the strongest decrease of the polhode radius occurred. The rate (per time) of relative change of the polhode radius for this period between June 14 and July 2 1908 was the largest not only in 1908 but also for the whole period of 1907-1910!
- Interestingly, the volcanic activity probably gravitated to some of the above-mentioned dates of polhode's disturbances. At the first half of May 1908 the most strong since 1894 activity of the Kilauea volcano began [41]. On May 10, 1908 on the Savaii island from Samoan group the most powerful for the whole island's history volcanic eruption commenced [42]. Since April 1908 the fumarolic activity of the Erebus volcano, which slept since 1900, was increased with significant upsurge on June 17 [43]. Also on April 29 a remarkable eruption of the Etna volcano, which slept for 15 previous years occurred [44].
- Moreover, while from the spring to the autumn of 1908 there was an unusual absence of large earthquakes and a decrease of the number of earthquake reports (so the seismic energy release that year was one of the lowest for 20-th century), on June 30 and July 1 the number of registered earthquakes was increased. Below is the number of earthquake reports all over the Earth per day (according to their universal times), a week before and a week after the Tunguska. The initial data is taken from [45]:

  June 23 - 9
  June 24 - 10
  June 25 - 7
  June 26 - 7
  June 27 - 4
  June 28 - 7
  June 29 - 6
  June 30 - 17
  July 1 - 17
  July 2 - 7
  July 3 - 10
  July 4 - 3
  July 5 - 6
  July 6 - 8
  July 7 - 7

So there are evidences of the large scale (global?) disturbances in the Earth interior in 1908 which culminated at about the Tunguska time.

There are also some other evidences of the extreme geophysical situation at the time of the Tunguska. On June 29 the 'Alps Glow' phenomenon was registered in Austria [46]. Remarkably, it was the only registration of this phenomenon for the whole 1908 summer [46]! Interestingly, that the exceptional sky glow (aurora?) was observed by the Sir Douglas Mawson expedition in the Antarctic just 7 hours before Tunguska [47]. In the expedition papers this glow was described as "The most extensive glow aurora seen on trip" [47]. Curiously, the global geomagnetic activity on these days was rather low [46], so the geomagnetic conditions were against the auroral activity. The only geomagnetic disturbances known to the author were unusual character and were registered in Kiel, Germany [48]. The disturbances occurred every evening June 27-30 for about 7 hours and had the period of 3 minutes. They were not ascribable to any recognized cause [48].

There was a report on disturbances of telegragh lines near Prague at about June 30 [49].

A very powerful (gas?) explosion occurred on July 1 at Makar'evskii mine (not far from the town of Taganrog, Russia) with catastrophic results and on this day the Geophysical observatory near S-Petersburg registered strong air-preassure disturbances.

It is important to note that on June 30 the appearance of a rather large solar protuberance was discovered [46].

There were also some peculiarities in global atmospheric circulation at about the Tunguska date. In June 1908 a high barometric maximum was lying in the north (the Arctic region), and the winds were blowing from the north [49,50]. Cyclones over the Siberia in June were much deeper than usual, it led to significant increase of air pressure gradients [51] (it could also lead to activation of tectonic processes). Another peculiarity was a unusual warm (hot) weather over the Europe and, especially, Siberia in the second half of June. Together with the small number of thunderstorms it led to drought in some regions.

At the beginning of July the situation sharply changed. There was a strong increase in thunderstorm activity. Powerful thunderstorms took place [51,52]. For, example in the Perm' province, Russia in July a quantity of precipitation was a record for the whole 70 previous years of measurements. The northern (Arctic) area of high pressure sharply decreased in dimensions [51].

The author also would like to emphasize that notes of the Tunguska region meteorological stations reveal that it was a change from good weather to a bad weather right on June 30, 1908 (expecially the morning). Recently the author discovered that in late 1920-s while discussing the Tunguska in Soviet Academy of Science outstanding Soviet meteorologist Prof. Mul'tanovskii B. attracted attention on a possibility of cyclonic air mass movement activation at the place and the date of the Tunguska!
As a conclusion, it could be stated that at about the date of the Tunguska there was the large-scale (global?) as well as local (Tunguskan) disturbance of geophysical situation, including activation of the tectonic processes.

3.5. THE PROPOSED SCENARIO OF THE TUNGUSKA

The proposed scenario of the 1908 Tunguska event is following.
The large-scale (global?) geophysical disturbance of late June 1908 (see section 3.4) manifested as the activation of the tectonic processes in the southern part of the Siberian platform and in the Lake Baikal rift. On June 30 the activation revealed itself in the most bright form - the Tunguska event.
The first phase of the Tunguska began with the appearances in the atmosphere over the southern part of the Siberian platform (and possibly in adjacent regions) of luminous effects. Some of them were meteor-like and being mistaken for a bright bolide (meteorite fall). In general, they appeared above tectonic faults, circular structures, etc.. At about the same time, seismic processes broke out over an extensive area, most probably involving just the surface layer of the ground (small focal depth). At the vent of the Kulikovskii paleovolcano, the endogenic energy was released in a spectacular explosion-like form (NNE), uprooting trees on a large area. The seismic and other phenomena probably lasted for several hours from place to place.
Below, the author tries to demonstrate, how the tectonic interpretation can explain the phenomena, which the meteorite one fails to explain.

3.6. THE EYEWITNESSES ACCOUNTS

The luminous phenomena of the Tunguska are in the stream of the "tectonic lights" (see sections 3.1, 3.3). So now just let explain the existence of the "three trajectories of the Tunguska meteorite fall". If we look at the tectonic map of the region (see FIGURE1) we could see that all three trajectories are above the main tectonic faults of the region. The eastern trajectory superimposes on the Beryozovsko-Vanavarskii fault, the south-eastern projects on the Norilsk-Markovskii fault, and the southern trajectory is over the Angaro-Khetskii fault and partly Angaro-Viluiskii fault. They intersect inside the Vanavara circle structure.
Interestingly, at first, it was thought that the meteorite fell at this intersection site, because local Evenks told about a forest fall, fire and a disintegration of a hill (cliff) in this region. Also there were reports about an appearance of unusual pits in the ground at this region. But, unfortunately, the first research in the area was conducted just in 1960-s and didn't produce definite conclusion.
The other places whence reports came about some manifestation of the Tunguska also happen to lie near major geologic features, like the Chadobedsko-Irkineevskii fault and the Chadobedskaya circle structure in the southwestern sector, for example.
The low heights of luminous phenomena explain why there where different accounts from the same settlement, and why practically nobody saw the fireball close to the epicenter, as at Vanavara, for example. The several lightning-like explosions at the epicentre, reported by the Evenks are in a good agreement with the typical series of 3-4 explosions during the Barisal guns events (see section 3.3).

3.7. THE FOREST FALL

According to the tectonic interpretation, there could be the following causes of the forest fall (probably they combined):

- "usual" blast air-wave of the explosion. Despite we are not aware of its physical mechanism, intuitively it seems plausible that "an explosion" must produce blast waves, and the acoustical disturbances (the sounds), and the registrations the accompanied barometric disturbances all over the world prove it;
- The wind (generated by tectonic processes) action. It also can be interpreted as a "soft" form of blast air-waves (or NNE);
- The surface seismic wave action.

Early the author already mentioned unexpected strong wind accompanied the 1886 Chembar event and whirlwinds, accompanying the Barisal guns events. Here are examples of winds connected with earthquakes, taken from the author's collection and from [53].
One of the first cases was referred by the great French physicist Arago F., that on July 5, 1582 in Germany the earthquake produced a strong windstorm.

- August 30, 1757, Florence, Italy. The earthquake was preceded by a very high wind, which ceased immediately after the shock.
- December 6, 1758, Russia. The earthquake was accompanied by a terrible tempest, that ceased when the earthquake ended.
- January 16, 1759, Aix-la-Chapelle, France. Great blasts of wind accompanied the quake. They increased and decreased with the shocks.

- August 17, 1760, Salonika, Greece. Violent thunder, wind, and rain immediately succeeded the shock.
- June 14-15, 1830, China. During the first shock the strong windstorm began with rain and hail.
- 1848, New Zealand. The earthquake began in a gale of wind.
- May 26, 1910, Switzerland. On the night previous to the earthquake violent thunderstorms visited the places later affected by it.
- June 27, 1925, Montana, USA. The earthquake occurred during sudden windstorm.
- 1971 and 1972, Grozny town, USSR. On the evening September 13, 1971 the unusual "thunderstorm" occurred in Grozny. Silent "lightnings" flashed on the clear sky. They were like white or red flashes "running" over the sky. After about 10 minutes a windstorm began. Clouds appeared later and it rained. Soon the sky became clear again, but the windstorm continued, accompanied with "silent lightnings". The duration of the windstorm was about 50 minutes. After the wind ceased, "silent lightnings" were still active for some time. The wind was so strong that windows were broken and at some places roofs were blown away. Another intriguing fact is that the meteorological data didn't conform neither windstorm, neither thunderweather. Next evening the moderate earthquake (M=3.5) struck the town. The same "silent lightnings" occurred in the town on September 27, 1972, before the earthquake with M=3.3.

Of course, some of the occurrences maybe just coincidental, but in the others the probability of accidental coincidence seems to be very small. The analysis of 490 earthquakes [54] revealed that a few percent of them were accompanied with different forms of wind action.

It is interesting to note that the Tunguska forest damage resembles a damage caused by so called a downburst (a strong downdraft of the atmospheric air). Moreover, the Tunguska meteorological conditions hint on their some possible resemblance with those favorable for 'dry downburst'. Maybe a downburst, or several of them triggered or even driven by the tectonic processes (for example, by heating the atmospheric lower layer, by an increase of the atmospheric electric field, by degassing etc.) played a large role in the formation of the Tunguska forest-fall?

And one more interesting detail. As above-mentioned, the great percentage of the survived trees have lightning or lightning-like damage (also see below). But sometimes lightning strikes could be accompanied by blasts of hot air [55]! Now a few words about the rotation of the fallen trees in the Tunguska epicenter (see section 2.2). A rotation of various objects in epicenter areas of many earthquakes is well-known. For example, in the epicenter of the 1966 Tashkent, USSR earthquake the rotation was about 10-20 degrees. At some earthquakes the rotation achieved 180 degrees. Probably, the most intriguing rotation is known during the 1822 Valparaiso, Chile earthquake, where 3 standing close to each other palm-trees turned around each other like a screw. Also, it could be mention that ball lightning explosions can produce some torque. Moreover Dr. Alfred J. Bedard Jr. of NOAA/Environmental Technology Lab. confirmed to the author that some downbursts indeed produce a rotation.

3.8. THE TREES BURN

According to the tectonic interpretation there could be 2 general sources of the trees burn: the light (including infrared and ultraviolet) radiation from the explosive source(s) and electric currents generated by it (them). The burn by the electric currents could explain the 'lightning-like' tree damage, the burn at the site of the branch break (see section 2.3) and the spot-like character of this burn. Please, also pay attention that the electric discharges could be responsible for the thermoluminescence anomaly in the epicenter.

Anyway, cases of burn in connections with earthquakes are known. For example, during the 1693 Sicilian earthquake, the small town of Millitello was suddenly plunged into an unusual mist, and a loud explosion was heard. After the disaster, the ruins of the town and its environs showed traces of burn, while the vines in the surrounding countryside looked scorched. More recently, in 1988, bushes were burnt in places in the area of a tectonic fracture on the site of the earthquake in Spitak, Armenia. See also sections 3.1, 3.3.

3.9. THE SEISMIC PHENOMENA

If we look at the map of the tectonic faults at the region, we could see, that the reports on seismic phenomena came from the areas close to tectonic faults and circular structures. Especially strong the seismic phenomena were along the Angaro-Khetskii fault and the southern part of the Angaro-Viluiskii fault. The Angaro-Khetskii fault is also a part of the Trans-Aziatskii lineament, which crosses the whole Siberian platform. The increased number of sky glows (auroras?) was detected over it.

So, besides the main seismic source at the Tunguska epicenter, there were probably a lot of weaker sources in those areas. Some of them were strong enough even to affect the nearest Irkutsk seismograph and to prolongate the recording. Probably, the sources were of the small focal depths.

3.10. THE CHEMICAL TRACES

In [16] it was recognized that the composition of the discovered microparticles resembles the traces of increased tectonic activity or volcanic activity. But authors of [16] were not aware of the increase of the tectonic activity at the Tunguska site and time (see section 3.4).

The author also states that discovered chemical anomalies are very similar with accompanying tectonic and volcanic activity. The author compared them with microparticles from the Kamchatka volcanoes and found that their morphology and even dimensions are also similar.
Iridium is also revealed in the volcanic emanations, especially from the "hot-spot" regions [56].
Discovered isotopic anomalies at the Tunguska epicenter also conform the tectonic activity.
Besides volcanic (tectonic) degassing/emanation, it is also important to mention that there are some evidences that some substance could be brought by the luminous objects, at least, sometimes.

3.11. THE BIOLOGICAL CONSEQUENCES

The author can refer to the work [57]. In there it was discovered the increased number of chromosome mutation in seismically active regions. It is also known that electricity (remember its probable role in Tunguska!) accelerates a tree's growth.
And the another interesting effect, possibly having relation to some anomalous manifestations of the Tunguska. At a half an hour before the 1988 Spitak earthquake (Armenia, USSR) the launched at Yerevan city ballooned cosmic rays counter began to register the increase of counts unusual character [58].
It is interesting also to note, that at many trees from the Tunguska epicenter the lignification of the 1907 tree rings wasn't completed to the time of the Tunguska [59]. It looks strange from the meteorite point of view. But from the tectonic interpretation, it is well-known, that before earthquakes a plants are affected sometimes, with a tendency to a negative influence.

3.12. THE SKY GLOW

As we saw, the meteoritic interpretation doesn't explain the sky glow. So it can be proposed that the Tunguska and the sky glow are independent and their coincidence is pure accidental. It is possible, despite the impression amongst many scientists that they are somehow related.
The tectonic interpretation admits that probably they are just different manifestations of the same geophysical processes. The author already mentioned some geophysical peculiarities of the mid-1908. But there are also some signs that they began earlier. The spring of 1908 was rather unusual. There were very strong floods on many Russian rivers. For example, Moskva-river (which had a record flood for the whole previous 100 years period), Oka-river, Volga-river. Large areas were flooded.
It is interesting to recall the work [60], where it was discovered that a high Mississippi river level suppresses local earthquakes 3 months after and induces 9 months after, but the number of reports on unusual luminous phenomena is increased a few months after, i.e. when earthquakes are suppressed. On the other hand, in [60] there is an example of the "airship" event during which odd, nocturnal luminosities were seen over more than a dozen central and southern USA states from January through April, 1897. At the time one of the greatest floods to have ever affected the midwestern USA, was occurring. One month later, on 31 May, the intense Giles Country, Virginia earthquake struck "and the airships were seen no more". In some way, it resembles the 1908 events, as some authors state that during the 1908 spring there were the numerous reports about unusual luminosities, and the places of their appearance were drifting from the European part of Russia to Siberia, and that after the Tunguska the luminosities disappeared. But, of course, the definite conclusion can't be done now.
Let's continue with the geophysical peculiarities of the first half of 1908. On May 23/24 it strong snowed in Switzerland. On June 5 and 6 it snowed in S-Petersburg and Petrozavodsk, Russia. Many unusual atmospheric phenomena were seen; a great number halos, strange rainbow etc. But, of course, the most remarkable were phenomena seen on the night (evening) sky. In the evening, March 27 an unusual sky illumination was seen in the north-eastern parts of USA and a thousand km from the shore [61]. It was described as never seen before and in many aspects resembled the sky glow of late June-early July 1908. The author also should mention that similar phenomenon was seen on the evening March 26 and the following several nights in the town of Yur'yev, Russia (now Tartu, Estonia). On this days a geomagnetic activity was enhanced, but as, already mentioned, the glows didn't look like usual aurora. On May 27 the first time since 1906 the "sky-colored clouds" were seen in UK [62]. The next days the sky was too cloudy.
Here we come up to the atmospheric abnormalities of late June-early July 1908. In [46] they are explained as, i) the explosive development of noctilucent clouds; ii) the increased luminosity of the night sky glow. Let's think about their possible origins. Now it is usually thought that for development of noctilucent clouds 3 main conditions must exist: a low temperature at about 80-90 km height, a presence a sufficient quantity of water vapor and small nucleus of water vapor condensation. What could be the cause of the upsurge in any of them?
At first, let us remark, that the late June-early July is the season maximum of a noctilucent clouds appearance. Moreover, as we already saw, this time was the time of the large-scale weather break, roughly speaking, from drought to thunderstorms. In other words, in the atmosphere the quantity of water vapor was significantly increased.
The following factors could also "help" the noctilucent clouds formation. The first one is the increase of the solar activity in the late June. It is known that the increase of the solar activity leads to some decrease of the atmospheric transparency, probably due to build up of microparticles, i.e. condensation nucleus. And also solar flares, and especially solar proton events could lead to the cooling of the middle atmosphere [63]. The author also proposed that the increased tectonic activity could produce an upsurge in the Earth degassing and some of the gases through various chemical reactions could lead to elevated quantity of water vapor in the atmosphere. Anyway, the majority of the noctilucent

clouds registrations from the "Salyut" spacestation was over the regions with high volcanic and seismic activity [64].
And finally, the Tunguska explosion itself could lead to a cooling of the upper atmosphere and an upsurge of the noctilucent clouds formation due to a generation of acoustical-gravity and other atmospheric waves [65].
The sky glow of the late June-early July produced no appreciable absorption of a light: "though thin, they were strongly illuminative, and stars shone through them with surprising distinctness" [50]. The daily atmospheric absorption measurements in Paris [46] also revealed no extraordinary absorption on the days of the sky glow, but, as usually on the eve of a weather change, a polarization have changed [46], revealing the appearance of small nucleus in the atmosphere. The author discovered monthly averaged data on absorption in Irkutsk, and they also revealed no anomalies [66]. The detailed analysis of the Smithsonian Astrophysical Observatory data on absorption in USA [12] also revealed that no increase of dust in the atmosphere is associated with the Tunguska, just increased water vapor quantity.
So, despite we don't understand the physics of the processes well, the unusually large appearance of noctilucent clouds conforms with the geophysical situation of that period and the air-waves from the Tunguska explosion probably also made a contribution.
Now let's consider the increased luminosity of the night sky glow. At first, the author would like to mention that the sky glow phenomenon occurred in connection with earthquakes (see also section 3.1). Here are just 2 examples. The earthquake happened September 12, 1841 near Russian town of Nizshnii Tagil. At 2. a.m. a thunder-like rumble was heard and the ground trembled. At 4 a.m. the sky was flooded with the pink light, which at 5 a.m. transformed to the yellow one. The whole day the sky was yellowish, and filled with a smoke. At the place located 40 km to the south-west from Nizshnii Tagil at first a fiery cloud appeared at 5 a.m. on the north-west and for a few hours spread all over the sky. No wind. The second example is the ill-fated Rumanian earthquake of March 4, 1977. From the western part of USSR the permanent pink sky glow was seen with flashes imposed on it. In Rumania the sky glow was in western direction from the earthquake epicenter [55].
Another intriguing luminous phenomenon is probably related with submarine volcanoes activity 1000-2000 km away from it [67]. On 9 April 1984, crews of three separate commercial airlines observed a gigantic mushroom-like weakly luminous cloud. It reached an altitude of about 18 km and a diameter of 320 km for about 2 minutes. No other abnormalities were observed. After the detail research, the connection was proposed with the upsurge of the submarine volcanoes activity about 1000-2000 km from the cloud, but the physical mechanism is still a mystery.
So the first cause for the large-scale sky glow could be the large-scale activation of tectonic processes. Of course, with the present day knowledge we can just propose it and can't prove. But the most important is that similar sky glows happen many times without any giant meteorite or comet. We begin with cases of just luminous spots in the night sky. When this phenomenon looks like bands on the sky, it is sometimes called "non-polar aurora". Some displays seem related to auroras, while others not. German researcher Hoffmeister C. studied this phenomenon for many years. He got their altitudes 90-180 km, with distinct maximum at 120-130 km. According to Hoffmeister's opinion, their spectrum is the enhanced usual night glow one, and they are closely related with noctilucent clouds. He discovered their correlation with disturbances of radiowaves (wave lengths 350-530 m) propagation. He also conducted statistical analysis and revealed 12 yearly (i.e. 'inside' year) maximums, with one of them on June 18-30. Below are several examples of luminous spots taken from [55].

- 1898, September 11, West Virginia, USA. Oval luminous cloud appeared and disappeared 10-20 times. No auroral activity noted.
- 1915, December, England. A glow in the northern sky, but no magnetic activity to suggest an aurora.
- 1922, January 30, Cumberland, England.
- 1922, September, Sussex, England. A long streak of light above the southern horizon.
- 1957, October 7, Aden. Pale green glow in the sky over Indian Ocean.
- 1978, April 4, Hawaii. Spectacular luminous spots on the sky [68]. It was discovered in [68], this and other similar luminous spots and sky glows tend to occur within 3 hour of lower or upper lunar transit (i.e. about the time of high lunar tide). It hints the probable role of acoustic gravity waves, despite that physical mechanism of the influence wasn't understood [68].

Returning to the Tunguska, we see again the probable role of the acoustic gravity waves, excited by the Tunguska explosion, as well as lunar-solar tide (the angle between the Moon and the Sun was rather small on the Tunguska days).
Now let's examine the cases of the whole sky glows, which often called "glowing night skies" [55].

- 1783, June 18 and the following month, Europe. This year bright nights were caused by "luminous fog", associated with the eruption of the Laki volcano. This phenomenon appeared simultaneously June 18 in France and Italy. It was seen in the north of Africa, Sweden, North America and lasted for more than a month. It was at the tops of the Alps also. It ignored wind and rain. At some places it was so strong, that the sun could not be seen near horizon. It reeked nasty and was dry (moisture 57-68%). It looked self-luminous. In open sea it was practically unseen.
- 1831, Europe and the west Siberia. This year bright nights also were caused by "luminous fog", resembling the 1783 "fog" and associated with the eruption of the Babuyan Claro volcano. On the African shore it was seen on August 3, in Odessa, Russia - August 9, France -August 10, in New York - August 15. The sun could be looked at by naked eyes. In the region from Berlin to Irkutsk it was possible to read at some summer nights. But the phenomenon was distributed in spot-like manner. At some places it was very weak and of short duration
- 1857, January 26, Quito, Ecuador. The sky was bright enough to read print easily. The atmosphere itself seemed luminous.

- 1861, June 30.
- 1880, August. The sky unusually bright for the whole month.
- About 1886, Florida. Everything was illuminated with a pale greenish light so intense that it was possibble to read by it. The atmosphere was hazy, and it was not possible to make out the stars, and the light seemed to be general and from no particular direction.
- 1908, July 31, England. Sky bright, especially toward the north.
- 1908, August 4, England. Bright night, clouds illuminated by a pink light.
- 1910, September 29, Yerkes observatory, Wisconsin, USA. There was no trace of the aurora. The sky on which the luminous haze was seen, was at this time, brightened with a pale uniform illumination covering the entire heavens.
- Late 1916 through 1919, England. Many reports of very bright nights during this extended period. 1916, December 23: bright night in England and France. It was possible to read heads of newsparer articles. The glow didn't affect telescopic observations of stars. Some observers said that the brightest part of the sky followed the path of the Sun below the horizon, and was almost exactly due North at midnight. Remarkably that an upsurge of solar activity occurred that time and on December 25 a formidable thunderstorm struck England. There was a new Moon (as during the Tunguska time).
- 1917, December 14, England.
- 1918, January 13, England.
- 1918, September 30, England.
- 1918, December 5, 7, 14, England.
- 1919, November 25, England.
- 1919, December 14, England.
- 1929, November 8, Essex, England. The exceptional brightness was seen all over the visible hemisphere, no direction being obviously favored. Photometric measurements indicated the sky was four times its normal brightness. The auroral line was not conspicuous and no magnetic disturbances were recorded.
- 1949, October 17 through the rest of the month. England.
- 1958, May 20, Indian Ocean. Whole sky was bright, particularly toward the north.
- 1959, November 30, Hawaii(?) [68]. The entire sky was bright with a pinkish cast and with cirrus-like structure. At dawn, the entire sky was completely clear. The red OI lines at 630 microns and 636.4 microns were enhanced, and the red end of a low dispersion spectrogram showed a strong enhancement (OH bands?). The green line and the blended sodium lines were of normal strength. A solar flare had occurred earlier.

So, these luminous phenomena are rare, but not unique events. The physical mechanism is not known, but the author probably can say, why we could expect their appearance at the late June-early July 1908.

The first and probably the most important argument is so called "weather lights" [55]. Usually they are luminous whitish or reddish patches on the horizon, often mobile, and located at any azimuth. Their appearance followed by a sharp weather change, generally a storm [55]. As we are aware, the early July there was a large scale weather break to thunderstorms (also favorable for NNE). A good example of a similar glow on mini-scale is the sky glow on December 23, 1916 (see above).

It is interesting, that "earthquake lights" tend to occur during a passage of cold weather front!

Another argument is the upsurge of the atmosphere glow sometimes seen by cosmonauts from spacestation by naked eyes [64]. The phenomenon consists of several parts. i) The appearance of the second luminous layer of the atmosphere at 250-350 km heights. ii) The increase of the luminosity of the well-known first luminous layer at about 90 km height. iii) The complete glow of the whole atmosphere. It is interesting that the areas with the second luminous layer coincide with the areas of increased proton and electron radiation intensity and increased ionospheric turbulence. Usually these phenomena tend to occur during geomagnetically calm period between geomagnetic disturbances and during solar flares (see also above on the glow of November 30, 1959). As we know, the late June-early July 1908 was a period of increased solar activity.

Sometimes glow was seen even above the spacestation, and one time the visible reddening of bright stars was registered! Indeed, our planet still has a lot of puzzles!

So, the author think that the 1908 Tunguska event and the sky glow of late June-early July 1908 are just different manifestations of the same 'tight' geophysical situation of that time.

3.13. OTHER TUNGUSKAS

As we saw, there are a lot of examples of small-scale Tunguska. But do besides Tunguska powerful events occur? In the author opinion the answer is positive. Let's look through the known history. Even some events described by ancient authors hint on their possible NNE origin. Of course, we can understand ancient writers descriptions very badly, so the author could talk just about "suspected" events. Here are just everal examples.

- Circa 500 B.C. A "lightning" destroyed the town of Volsinii [69]. Pay attention that Volsinii is also a name of the volcano. But, of course, we can't completely exclude the possibility of some kind of volcanic eruption.
- 956 A.D. The Arabic author from the Middle Ages As Suiuti Dzshalal described the strong earthquake of 956 A.D., which devastated a town of Khamadan (now in the west of Iran). But a town of Kasr-e Shirin was

destroyed by a 'lightning' and many people perished under the ruins. The ruins possibly still exist. Does anyone research them? Who knows, maybe it was a "Tunguska" a millennium ago?

- 1110 or 1111 A.D., Lake Van, Turkey. During the winter night, the sky suddenly opened (chasma event), and a large flame came down on Lake Van. It terribly roared and waves were thrown on shore. Water and ground trembled. Very deep fissures were formed. Famous French scientist Arago F. described this event as of 1110 A.D., and that fiery body fell into Lake Van. Its water became bloody-colored.

The circumstances of the event hint on NNE. It is supported by that the prominent Suphan Dagi volcano is sleeping on Lake Van shore, and this area is the area of increased tectonic activity (earthquakes occurred rather often),

- Circa 12-th century. the South island of New Zealand. Maori oral history tells of "the falling of the skies, raging winds, upheaval of the Earth, and mysterious devastating fires from space." Near Tapanui (which on Maori language means a big explosion place) there is so-called Landslip crater, a depression with dimensions 900 m by 600 m and the depth 130 m. In this area there are a lot of small silicate globules and extirpation of the moas about this time took place. There are also some reports about fallen trees, which are aligned radially away from this site to a distance of 40-80 km, and tend to point radially inward beyond [70]!

In [70] it was proposed, that it was caused by a large extraterrestrial projectile. According to geological research, this crater is a geological formation [70]. In the author opinion, existing data favour for endogenic origin (NNE), this area is the area of increased tectonic activity (earthquakes happen from time-to-time).

- 1737, December 16, Europe. The author is searching for the details of this remarkable event seen by the whole Europe, and probably at some other places, but today almost forgotten. Below is the summary what the author can obtain up today.

This was the time of "light nights"[71].

In Naples, Italy, in the evening, when the sun was 25 degrees below the horizon, a light was observed in the north, as if the air was on fire, and flashing. At 3 a.m. it was much brighter and spread much westward. Its greatest height was about 65 degrees. The light boundaries were jagged, and scattered, and follow the course of the westerly wind. Stars of 3-th and 4-th magnitude could be easily seen through it. About 4 a.m. a very regular arch was seen to rise gently. About the 6 a.m. the intenseness of the color disappeared, and it vanished at 7.30 a.m.

In [71] there is a reference on the preceding eruption of the Vesuvius volcano, but the closest preceding eruption the author is aware was just in May, 1737.

In Padua, Italy, after sunset on the preceding days, as well as Dec. 16, there appeared in the west a remarkable redness. The same glow happened and on the following evening. On the evening Dec. 16 the air was calm and the barometer was remarkably high. At 5.15 p.m. there appeared near the horizon a blackish zone. Above this zone was another very luminous, resembling the dawn pretty advanced. The highest zone was of a red fiery color. Eastward they extended to the 55 degrees on the horizon, and westward to the 70 degrees. Near zenith there appeared some thin lucid clouds. A little after 6 p.m. the upper part began to emit streamings, or rays, in plenty. Its color was red mixed with whitish and darkish. In a few seconds after, there issued out from the very equinoctial west, a red and very bright column, and a little later, it became curved in the shape of the rainbow. At 8.30 a.m., almost in an instant the bright zone, from the 8 degrees west to the 50 degrees east, became more vivid, and rose higher; and above this appeared a new large one, of a red fiery color, with several successive streaming tending upward, and passing 60 degrees of altitude; the western part had assumed the form of a thin cloud. At 12 p.m. the light was nearly extinct. Twenty minutes after, there appeared a white brightish beam, at 30 degrees west and 60 degrees high, but it soon became invisible. In half an hour later, a very weak light remained in the west, near the horizon.

In Bolonia the glow was so very remarkable that no one remembers to have ever seen the like, it was possible to distinguish houses at a great distance. At 8 p.m. the glow formed itself into a concave arch towards the horizon. The polar star was near the top of its convexity, and some stars shone bright in the midst of the light. At 8.34 p.m. the red light continued spreading. At the upper part, a considerable part of heavens was enlightened with a very vivid red light, which was interrupted by several vertical streaks or columns of a bright yellowish light. At 9.04 p.m., there remained but a little reddish light at the north pole, all the rest was collected near the zenith. In the south, where the sky was clear, there were seen some of those meteors, called falling stars. Several persons reported that in the evening Dec. 16 they perceived a certain stench in the air. There was a very thin fog in the air not only on Dec. 16 but also on the preceding and following days. The mornings of Dec. 17, 18, before and a little after sunrise, the air appeared of an uncommon fiery color. The evening of Dec.17 the crepusculum was of an extraordinary height. Between the north and west, there was seen a very thin fiery red "vapour", which lasted almost till night.

At Edinburgh, England, at 6 p.m. on looking out at windows, the sky was in flame. There was an arch of this red light reached from the west, over zenith, to the east. The northern border of this light was tinged with somewhat of a blue color. This glow did not look like common aurora. It gradually and gently stole along the face of the sky, till it had covered the whole hemisphere. A great circle of the glow came from the west to the zenith.

At Sussex, England. It was a strong and very steady red light. It did not seem to dart or flash at all, but continued going on in a steady course against the wind, which blew fresh from the south-west. It began about north-north-west, in form of a pillar of light at about 6.15 p.m. In about 10 minutes, a 4-th part of it divided from the rest, and never joined again. In 10 minutes more it described an arch, but didn't join the top. Exactly at 7 p.m. it formed a bow, and soon after quite disappeared. It was all the while lightest and reddest at the horizon. At 8 p.m. it began again exactly north. In half an hour it made an arch from east to west, and went quite away to the south, when it ended much with the same appearance as it began in the north, but not quite so red.

At Sheffield, England, at 5 o'clock, afternoon, and all the evening appeared a remarkable brightness in the sky, of a blood-red color, very bright [72].
At Philadelphia on Dec. 16 nothing unusual was seen, but on Dec. 18 an earthquake struck. And "the second evening after, and for several evenings in that month, a red vapour appeared to the south and south-west, like the aurora borealis" [73]. On November 28, about sunset, many people in this town saw a fiery "meteor" in the air, large and bright, it seemed in the zenith, and so it seemed to others some miles from the town.
At Solikamsk, Russia (59.6 N, 56.8 E) on Dec. 17 night as a red light was everywhere above. In the morning it was hazy and stuffy. On Dec. 24 and 25 the phenomenon repeated in smaller degree.
In Chiloe Island, Chile, on Dec. 30 the fiery cloud from the north traversed the archipelago [55].
But probably the most remarkable event occurred at Kilkenny in Ireland on Dec. 16. A great ball of fire appeared, which burst with an explosion that shook great part of the island, and set the whole hemisphere on fire, which "burned most furiously, till all the sulphureous matter was spent." [72]. In [55], cited another source, it was written that on Dec. 26 (probably misprint), much of the Southern Europe was covered by a reddish, luminous haze. At Kilkenny it appeared like a ball of fire in the air, which lasted about an hour and then burst into pieces.
There is a tectonic fault near Kilkenny, and weak small focal depth earthquakes happen in there from time-to-time. Why not the Ireland Tunguska of 1737!

- 1930, August 13. Brazil. This event is known as the "Brazilian Tunguska" or the "Curuca event" [74]. At first the sun darkened, then fine ash began to fall. Then hissing sound appeared. Three fireballs fell into jungles, accompanied with thunderclaps and earth tremors. In the author's opinion [3], it was tectonic event (earthquake with accompanied NNEs). The event took place in the region of paleovolcanic activity, but, unfortunately, a little is known about local geological structure.
- 1935, December (probably December 11). British Guiana [75]. Near the Marudi Mt. it was a sound of an explosion and an earthquake. A "trail of fire" was seen on the evening sky. Several eyewitnesses reported about a luminous body flew over. Some time later, an area of forest fall was discovered near Marudi Mt. with dimensions 5 by 10 miles. The trees were twisted off some 25 feet above the ground. In the author opinion it was NNE producing whirlwinds [3].

The author inclines to think that extremely powerful NNEs played a large role in so called astroblemes formation millions years ago [3].

4. CONCLUSION

The author thinks that the present material clearly points out to the endogenic origin of the 1908 Tunguska event, or, at least, the endogenic interpretation conforms with the facts much better then the meteoritic one.
Anyway, there are a lot of things to investigate about our miraculous planet, which, no doubt, will present us a much more puzzles!

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Date: Quarta-feira, 24 de Novembro de 1999 06:49
Subject: Tania: favor passar para o Nelio + arquivo attachado

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>Subject: Re: Objeto que caiu no Xingu
>X-MIME-Autoconverted: from quoted-printable to 8bit by marajo.csr.ufpa.br
id WAA09258
>
>Prezado Professor,
>
>Gostaria de convidá-lo a visitar nosso site onde colocamos
>uma primeira matéria a respeito do objeto no Xingu, com base
>nas informações que nos foram repassadas pelo repórter
>Ronaldo Vilhena e pelo Centro de Comunicação Social da
>Aeronáutica.
>
>O site é: http://www.vigilia.com.br Está na seção "Notícias".
>
>Estamos ansiosos por podermos voltar ao assunto e aguardamos
>as respostas do professor.
>
>Desde já agradeço.
>
>Grande abraço,
>Jeferson Martinho
>jornalista
>
>
>At 17:19 11/11/99 -0300, you wrote:
>>Prezado Jeferson,
>>É um prazer receber as suas notícias, assim como será, tentar responder as
>>suas perguntas.
>>Inicialmente, vou responder o seu e-mail apenas para lhe informar que eu e
>>Nélio estamos concluindo um relatório sobre o ocorrido e nós lhe enviaremos
>>uma cópia (favor enviar o endereço)
>>Sobre as perguntas, vamos conversar, juntos, e tão logo tenhamos terminado,
>>responderemos para você. Quem sabe nesse fim de semana prolongado.
>>Entraremos em contato em breve,
>>
>>Abraços,
>>
>>Rômulo
>>
>>

>>
>>At 15:19 11/11/99 -0200, you wrote:
>>>Prezado Professor,
>>>
>>>Meu nome é Jeferson. Sou jornalista em São Paulo e editor
>>>de um site/Revista eletrônica dedicado exclusivamente ao
>>>tratamento jornalístico, objetivo e científico de um tema
>>>bastante polêmico: Ufologia. (http://www.vigilia.com.br)
>>>Trata-se do maior site sobre o assunto no Brasil, além de
>>>ser o único com tal tratamento objetivo. Publicada unicamente
>>>através da Internet, a Revista Vigília tem acesso totalmente
>>>gratuito.
>>>
>>>A Assessoria de Imprensa da UFPA foi bastante atenciosa em
>>>informar-nos seu e-mail rapidamente após nossa solicitação.
>>>Estamos produzindo uma matéria a respeito da notícia
>>>relativamente recente da possível queda de um objeto no Xingu,
>>>a qual foi noticiada aqui nas regiões Sul e Sudeste exclusivamente
>>>pela Rede Bandeirantes de Televisão.
>>>
>>>Já entramos em contato com o repórter Ronaldo Vilhena, que junto
>>>ao sr. e ao também especialista Nélio Resende, integrou a equipe
>>>que conseguiu chegar ao local. Também já temos uma resposta
>>>oficial do Ministério da Aeronáutica informando que o sobrevôo
>>>ao local pelo Salvaero (de Belém) não identificou nada mais que
>>>uma área de "1/4 de um campo de futebol" (sic).
>>>
>>>Gostaríamos de contar com a opinião do Professor a respeito do
>>>episódio. Aqui, sobretudo nos circuitos da Internet interessados
>>>no tema "Ufologia", é forte a corrente que credita a ocorrência
>>>à posibilidade de queda de um Ufo. Já há incluvise hipóteses
>>>conspiracionistas malucas dando conta de uma "limpeza da área"
>>>após o serviço militar tomar conhecimento da suposta queda.
>>>
>>>Por não tratarmos apenas com especulações, gostaríamos de ouvir
>>>a opinião de especialistas como o Professor, que além do
>>>conhecimento do assunto ainda esteve no local e poderia ajudar
>>>a ponderar as possibilidades mais factíveis e menos improváveis.
>>>
>>>A informação da FAB, de área atingida de "1/4 de campo de futebol",
>>>corresponde ao que o senhor observou no local?
>>>
>>>Na conversa que tive com o reporter Ronaldo Vilhena, pedi que ele
>>>tentasse definir o cheiro "estranho" sentido no local, mas ele
>>>se disse incapaz de comparar a qualquer coisa que conheça. O
>>>professor tem uma opinião a respeito?
>>>
>>>Poderia ter sido apenas uma queimada? Ou alguma outra hipótese como
>>>a queda de um meteorito de fato, mas que teria sido completamente
>>>pulverizado a poucos metros do solo (esse tipo de ocorrência é
>>>possível)?
>>>
>>>Quais foram suas conclusões a respeito da ocorrência?

>>>
>>>Há similaridades entre a ocorrência no Xingu e a outra, há três
>>>anos no Maranhão, na cidade de Pamaranta? (não sei se a grafia
>>>da cidade está correta. Vilhena me enviou via Fax e saiu ilegível).
>>>
>>>Desde já agradeço sua atenção e colaboração.
>>>
>>>Atenciosamente
>>>Jeferson Martinho
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>>>
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CIDADES

Mistério no coração do Xingu

- Um fenômeno intriga a população de São Félix do Xingu e os militares que estiveram na ilha Coração onde um estranho objeto caiu

Amaury Silveira

Fotos: Cezar Magalhães

Nove dias depois do estranho fenômeno a mata ainda pega fogo no local em que caiu o objeto até agora não-identificado

Um objeto não identificado caiu na ilha Coração, localizada na confluência do rio Xingu com seu afluente José Bispo, no município de São Félix do Xingu - distante mais de 700 quilômetros de Belém -, abrindo uma clareira com mais de um quilômetro de extensão. A ilha fica próximo da aldeia Krokraimoro, dos índios Kaiapó que estão apavorados e não querem nem se aproximar do local. A equipe do DIÁRIO, ao sobrevoar o local, identificou nas proximidades também uma pista de pouso abandonada e possivelmente clandestina.

O fato se deu no dia 9 passado e até ontem, estranhamente, ainda havia fumaça na floresta, em um local onde a umidade é muito grande e a vegetação não permite queimadas, segundo habitantes locais.

O empresário local João Kleber foi quem tratou primeiro do assunto, ao ser avisado por seus empregados que estavam na floresta quando o fenômeno ocorreu.

Segundo ele, seu empregado conhecido por Chico navegava pelo Xingu quando ouviu um estrondoso barulho como se fosse uma explosão.

De imediato, pelo rádio da embarcação, ele comunicou para um outro empregado de Kleber o que ouvira e este cinco minutos depois visualizava a clareira ardendo em chamas, na ilha Coração.

Diante do fato, o rapaz pelo rádio, comunicou para João Kleber o que se passava.

O empresário imaginou que tivesse sido um avião a cair no local, pois ouvira pouco antes que um supersônico havia passado naquele dia no município.

Era um avião diferente, soube, pois tinha um ruído de motor diferente além de soltar uma fumaça preta, e não branca, como geralmente soltam os que passam por lá.

Diante do que soube, Kleber resolveu entrar em contato com o Salvaero em Belém, comunicando que possivelmente uma aeronave pudesse ter caído em São Félix.

No dia 12, de helicóptero, apareceram no município, seis homens da Aeronáutica do Mato Grosso, pedindo para Kleber lhes ensinar o local onde ocorrera a queda do que seria o avião.

Kleber foi com eles mas lhes disse que depois do contato que fizera com o Salvaero tomou conhecimento de que seria algo estranho, um objeto e não uma simples queda de uma aeronave.

A ilha Coração está distante da sede do município, cerca de 200 quilômetros, de floresta fechada, e acesso pelo rio Xingu, mas só por pequenas embarcações ou um transporte especial, como o helicóptero.

Eles sobrevoaram o local mas, diante das dificuldades de pouso, os homens resolveram retornar à cidade e somente no dia seguinte se aventuraram a descer na ilha.

No solo, caminharam cerca de 500 metros em local hostil, tomado pelo fogo e pela incerteza do que iriam encontrar.

O oficial que comandava a operação então se decidiu por retornar à base do Salvaero em Campo Grande, no Mato Grosso, prometendo retornar ao local com aparelhos de medir radioatividade, máscaras contra gases etc, pois achou, segundo Kleber, muito estranho o que vira. O oficial bateu fotos, examinou a mata queimada e comentou que estava diante de algo incomum e iria retornar com urgência.

Ocorre que até ontem passaram-se onze dias e os militares não retornaram para tentar esclarecer o que ocorreu na ilha Coração.

Vista aérea da sede do município de São Félix do Xingu

Muitas suposições em São Félix do Xingu

Alguns moradores acham que foi um artefato militar que por acidente foi jogado na área, de avião nacional. Quem sabe até mesmo a Polícia Federal que está destruindo pontes jogando bombas de aviões, para madeireiros não realizarem transporte clandestino de madeira.

Outros dizem que o intenso barulho ouvido teria sido de um caça militar sendo perseguido e por ter rompido a barreira do som, deu-se o estrondo. A perseguição teria sido a avião estrangeiro, que invadiu o espaço brasileiro e se desfez de algo comprometedor, atirando-o na floresta.

Há quem diga, entretanto, que na ilha Coração caiu mesmo foi um objeto extraterrestre e que, com calor intenso e até mesmo radioatividade ainda provoca a queimada contínua do local.

É importante frisar a preocupação de alguns fazendeiros e madeireiros da região, que não quiseram se identificar. Eles afirmam que a floresta amazônica não possui qualquer tipo de fiscalização de seu espaço aéreo e que já foram vistos nos céus do município aviões de outros países cortando a floresta.

Eles argumentam que isso possa ter ligação com fatos ocorridos recentemente na Colômbia, onde o Exército Americano faz programação sistemática de combate ao narcotráfico. Temem que algo mais grave ainda possa a ocorrer, não na floresta, mas em cima da própria cidade, sede do município ou mesmo em cima de qualquer uma outra cidade ou vila ou povoação da região, tamanho é o descaso das autoridades com a região, em termos de fiscalização de seu espaço aéreo.

Dizem que, um artefato estranho igual ao que abriu um quilômetro de clareira na pequena ilha, poderia matar centenas de pessoas em uma área urbana.

Vista aérea da Ilha Coração que fica perto da aldeia indígena Ko

A população de São Félix ainda está assustada. No detalhe, o empresário João Kleber

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DIÁRIO DO PARÁ

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Cezar Magalhães

No detalhe, o local onde teria caído e explodido o objeto não identificado, na Ilha Coração, em São Félix do Xingu

OVNI OU BOMBA EM SÃO FÉLIX?

Editoria de Arte/DIÁRIO

O empresário João Kleber foi avisado por seus empregados que estavam na floresta quando o objeto caiu. Ele comunicou o fato às autoridades.

Um objeto não identificado caiu na ilha Coração, no município de São Félix do Xingu, abrindo uma clareira com mais de um quilômetro de extensão. O caso está cercado de mistério e há várias hipóteses, entre elas, artefato militar jogado na área ou um OVNI, conforme acreditam moradores da região. Seis homens da Aeronáutica, de Mato Grosso, desceram no local e um oficial comentou que "estava diante de algo incomum". (A-8)

ÚLTIMAS

FUMO

Ação contra indústrias de cigarro

- Goiás entrou ontem na Justiça norte-americana com uma ação de indenização contra as indústrias de cigarro sediadas naquele país. O procurador-geral do Estado, Diógenes Mortoza, viajou esta semana para Miami, nos Estados Unidos, onde um escritório de advocacia representa os interesses de Goiás na ação. O objetivo do governo do Estado é arrecadar US$ 14 bilhões com a indenização.
- A notícia de que a ação foi protocolada na Justiça norte-americana foi divulgada pela agência Reuters, mas nenhum membro do governo goiano confirmou a notícia.
- O anúncio da contratação do escrtitório de advocacia Pudhurst, Orseck, Josefsberg, Eaton, Meadow, Olin & Perwin, com sede em Miami, foi feito no fim de julho.
- Na ocasião, Mortoza disse que o valor da demanda poderia facilmente atingir US$ 17 bilhões. O processo de indenização foi interposto por determinação do governador Marconi Perillo (PSDB)
- que pretende reaver para o Estado tudo o que foi gasto com a prevenção e o tratamento de doenças provocadas pelo fumo.

SAÚDE

CRM combate novos cursos de medicina

- "Novos cursos de medicina fazem mal à saúde». Com esse lema, o Conselho Regional de Medicina de São Paulo lançou ontem uma campanha contra a abertura de novos cursos de medicina e de novas vagas em cursos já existentes no país.
- Segundo o conselho, que tem o apoio da Associação Paulista de Medicina e do Sindicato dos Médicos de São Paulo, está havendo uma "proliferação desordenada» de faculdades por parte do MEC (Ministério da Educação) sem que haja necessidade social.
- As consequências, segundo as entidades, vão desde o acúmulo de profissionais em algumas áreas, em detrimento de outras, até a má qualidade dos cursos e dos profissionais.
- Há atualmente 92 cursos de medicina no país -a grande maioria na região Sudeste- e outros 18 pedidos de abertura aguardam aprovação apenas no Estado de São Paulo. Nesse Estado, há uma proporção de um médico para cada 479 habitantes -mais que o dobro do preconizado pela Organização Mundial de Saúde (um médico para cada mil habitantes). Por outro lado, na região Norte a proporção é de um para 1.489 habitantes.

VULCÃO - O vulcão Tungurahua, situado na região central do Equador, apresentava ontem altos níveis de vibração e emissão de gases, revelou o Instituto Geofísico da Escola Politécnica Nacional. O Tungurahua, que já obrigou a evacuação de mais de 35 mil habitantes da região de Baños e de outros povoados na base do vulcão. No sábado passado, as autoridades decretaram o alerta laranja na região do vulcão.

ARMAS

Quem usa tem 56% mais chance de morrer

- Pesquisa inédita da Secretaria da Segurança de São Paulo revela que as pessoas que andam armadas têm 56% mais chance de ser mortas por ladrões do que aquelas que circulam desarmadas.
- O estudo, encomendado pela secretaria para o núcleo de pesquisa do IBCCrim (Instituto Brasileiro de Ciências Criminais), faz várias estimativas do risco do porte de arma.
- Para isso, a pesquisa levou em consideração a população da cidade de São Paulo, de 1998, o número de armas registradas, estatísticas sobre apreensão de armas e boletins de ocorrência de todos os latrocínios (roubo seguido de morte) cometidos na cidade de São Paulo, no mesmo ano.
- Segundo o levantamento, 18,2% da população da capital porta arma de fogo legal ou ilegal. Ou seja, 1,8 arma para cada dez habitantes. Em São Paulo, circulariam mais de 1,8 milhão de armas nessas condições.
- Segundo o sociólogo e consultor da pesquisa Renato Lima, essa taxa de 18,2% da população armada funciona como uma espécie de "nota de corte". A partir dela, se estabelece a probabilidade de morrer ou sobreviver em um latrocínio.

GOVERNO

Covas deve ser operado de hérnia

- O governador de São Paulo, Mário Covas (PSDB), deve ser submetido a uma cirurgia para remoção da uma hérnia no abdômen no início de dezembro.
- Até lá, Covas terá que fazer uma dieta para perder 10 kg e reduzir a taxa de colesterol. Alimentos gordurosos e massas serão proibidos.
- Segundo o urologista Sami Arap, a hérnia de 3 cm surgiu no local onde Covas foi operado, há 10 meses, para retirada da bexiga em função de um tumor maligno.
- Arap explicou que o esforço físico provocou a abertura de alguns pontos e as vísceras invadiram parte do tecido abdominal.

FRAGA

Itamar quer indenização da União

- O governador de Minas Gerais, Itamar Franco (PMDB), encaminhou ontem ao Supremo Tribunal Federal (STF) uma ação por danos morais contra a União e o Banco Central (BC). O governador mineiro quer que o Estado seja indenizado em R$ 700 milhões.
- Itamar sustenta que o Estado foi difamado pelo presidente do BC, Armínio Fraga Neto, em Nova York. Fraga Neto teria desaconselhado investimentos em Minas Gerais. O STF informou hoje que o valor de R$ 700 milhões corresponde à média anual dos últimos cinco anos dos investimentos realizados no Estado.

PSDB deve R$ 3,5 mi da campanha de FHC

- Um ano depois de o presidente Fernando Henrique Cardoso ter sido reeleito em primeiro turno, seu partido, o PSDB, ainda deve cerca de R$ 3,5 milhões a prestadores de serviço e a fornecedores de material de campanha.
- Entre os credores está a Radiobrás (empresa de comunicação do governo), que vendeu imagens ao comitê eleitoral de FHC.
- O secretário-geral do PSDB, deputado Márcio Fortes (RJ), disse que a dívida deve ser paga antes das eleições municipais de 2000.
- "É possível que haja doações para liquidar essa dívida, estou trabalhando para isso, gastando saliva'', disse. Fortes não identificou os possíveis doadores.
- Em novembro de 1998, FHC prestou contas ao TSE (Tribunal Superior Eleitoral) e registrou uma dívida de R$ 2,9 milhões, assumida pelo PSDB. A campanha da reeleição arrecadou R$ 43,3 milhões e gastou R$ 46,2 milhões, segundo a prestação de contas, incluindo a participação do PFL.
- Fortes calcula que a dívida esteja hoje entre R$ 3 milhões e R$ 4 milhões por conta da correção e dos juros. É quase o valor da campanha de Luiz Inácio Lula da Silva (R$ 3,9 milhões), segundo a prestação de contas do PT e do PDT.
- O PSDB informou que vem reservando parte dos R$ 500 milhões que recebe por mês do Fundo Partidário e das doações mensais de R$ 150 dos parlamentares tucanos para reduzir a dívida.
- Os pagamentos têm sido feitos de forma a não atrapalhar as atividades do partido, como a contratação de pesquisas, a realização de convenção em maio passado e a divulgação de propaganda.
- A dívida com a Radiobrás, de mais de R$ 100 mil, foi parcelada e deverá ser quitada até o final do ano, disse Fortes. Outros credores são uma empresa de táxi aéreo e agências de publicidade. Segundo o secretário-geral, parte dos credores aceitou receber "depois''.
- A legislação eleitoral exige que o PSDB preste contas do saldo da campanha da reeleição e cobra a identificação dos eventuais doadores que contribuírem para quitar a dívida do partido.

MENORES

Campanha contra recrutamento

- Uma coalizão internacional de organizações não-governamentais (Ongs) iniciou ontem em Berlim uma conferência de três dias destinada a fazer campanha junto aos governos e à opinião pública para obter a proibição do recrutamento dos menores de 18 anos em exércitos regulares ou grupos rebeldes.
- Criada em junho de 1988, esta coalizão inclui mais de 100 Ongs como Amnesty International, Human Rights Watch, International Save the Children Alliance, Defence for Children International, Terre des Hommes, World Vision International, e várias outras locais da América Latina e África. A campanha pretende pressionar os governos para que adotem um protocolo adicional à convenção da ONU sobre os direitos do menor de 1989. O protocolo permitiria que a idade mínima do recrutamento e de participação nos conflitos, 15 anos, passasse a ser de 18 anos.

DIÁRIO DO PARÁ
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As colunas de Janio de Freitas, Clóvis Rossi, Carlos Heitor Cony, Fernando Rodrigues, Josias de Souza, José Simão, Painel Político e Contraponto são publicadas, simultaneamente, com a "Folha de S. Paulo". A coluna de Luíz Fernando Veríssimo é publicada simultaneamente com o "O Globo". A coluna Informe JB é publicada simultaneamente com o "Jornal do Brasil". A coluna do Estadão é plublicada simultaneamente com "O Estado de S. Paulo". Os artigos publicados com assinaturas não traduzem necessariamente a opinião do jornal.
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Obra da Cosanpa irrita moradores

▶Os moradores da avenida Paragominas, no Médici II, não agüentam mais o mau cheiro e mosquitos causados por um buraco

Uma obra não concluída pela Companhia de Saneamento e Abastecimento do Pará (Cosanpa) no conjunto residencial Médici II tem causado irritação nos moradores. Além dos transtornos provocados pela paralisação do trabalho, eles dizem que estão sendo desrespeitados pela Companhia que não cumpre agenda de reuniões previamente marcada.

O problema foi denunciado pelos moradores Mariinha Barroso, Márcia Garcia, Ishigake Yukihiko e Aldenora Gonçalves. À exceção desta última, os outros moram na avenida Paragominas, onde está a causa das reclamações.

A avenida está localizada ao lado de uma área de mata que faz parte de reserva ecológica demarcada pela Sectam (Secretaria Executiva de Ciência Tecnologia e Meio Ambiente). A área é protegida por uma cerca de arames que teve uma parte derrubada pela Cosanpa, segundo os moradores.

A Companhia abriu uma pequena clareira à margem da cerca e escavou um buraco de aproximadamente quatro metros quadrados de largura. Ali será construída uma estação de tratamento de água como parte do programa de saneamento e esgoto (Proserg) realizado pela Cosanpa.

Os moradores dizem que o trabalho na área se restringiu à escavação do buraco e foi abandonado desde o mês de agosto. Embora houvesse visitas esporádicas de técnicos da Cosanpa, a obra não teria evoluído e hoje se transformou em mais um transtorno para os moradores.

Segundo dizem, o local está servindo de reservatório de lixo. Recentemente um cachorro morto foi jogado lá dentro e o odor desagradável que dele exala já lhes deu muita dor de cabeça. Alie-se a isso o aumento de insetos que passaram a invadir as casas próximas ao buraco. Segundo os moradores, a causa do aumento de mosquitos seria a devastação da área provocada não só pelo buraco, mas por uma estrada que servirá de acesso para o monitoramento de obras da macrodrenagem. Eles dizem ainda que esses dois fatores aumentam a insegurança, pois pessoas desconhecidas dos moradores estariam usando a estrada como atalho.

Há temor pelo aumento dos problemas com a época de chuvas que se aproxima. Os moradores dizem que já agendaram reuniões com a Cosanpa duas vezes. Ambas foram desmarcadas por telefone há poucos minutos de serem iniciadas.

"Eles simplesmente desmarcaram. Não sabemos o porquê, mas precisamos de um contato maior com a gerência da Cosanpa para discutir isso. O inverno vem aí e as coisas vão piorar para todos nós", diz Márcia Garcia, que mora em frente ao buraco.

Alzyr Quaresma

O buraco abandonado pela Cosanpa inferniza a vida dos moradores

Cosanpa

Na Cosanpa, o assessor da Diretoria de Engenharia de Operações, Raimundo Maciel não estipulou um prazo para que o problema seja resolvido. Quanto às explicações sobre o porque da paralisação e do cancelamento das reuniões com os moradores, seriam informadas pelos coordenadores do Proserg, mas eles não foram encontrados ontem.

Outro

Em outro ponto da cidade, outra reclamação. Sílvia Maués está indignada com os serviços inacabados da Cosanpa. Residente na casa 64 do conjunto D. Fernando, na Humaitá, ela reclama de transtornos provocados por obra da Companhia.

Um buraco de aproximadamente meio metro de largura foi aberto em frente à sua casa para o conserto de um cano quebrado. Além de atrapalhar o trânsito na rua, o buraco deixado pela Cosanpa chegou a bloquear a garagem de Sílvia. Francisco Maciel, da Cosanpa, disse que o conserto da via pública é feito por empreiteira contratada pela Companhia, mas desde já se compromete a mandar resolver o problema.

AVISOS, ATAS E EDITAIS

GLAIRSON FIGUEIREDO S/C ADVOGADOS
Preposto do Agente Fiduciário BANCO DO ESTADO DO PARÁ S/A.
EDITAL PRIMEIRO PÚBLICO LEILÃO

CÉLIA MARIA CAMPOS CARDOSO, Leiloeira Pública Oficial, faz saber que aos 27 (vinte e sete) dias do Mês de Outubro do Ano de Um Mil Novecentos e Noventa e Nove (1999), às 10:00 Horas, na Travessa Castelo Branco, Nº. 1029 (Agência da CAIXA), nesta cidade de Belém/PA, devidamente autorizada pelo **BANCO DO ESTADO DO PARÁ S/A.**, Agente Fiduciário designado pela **CAIXA ECONÔMICA FEDERAL**, na forma da Lei (Decreto-Lei Nº.70 de 21/11/1966 e Regulamentação Complementar RD-08/70 do extinto BNH), venderá em PRIMEIRO PÚBLICO LEILÃO, Nº dia, hora e local acima referidos, os imóveis adiante descritos, para pagamento da dívida hipotecária em favor da **CAIXA ECONÔMICA FEDERAL.**
Ficam desde já intimados do presente Leilão, caso os mesmos não sejam localizados para cientificação pessoal.
A venda poderá ser feita mediante pagamento à vista, podendo o arrematante pagar Nº ato, como sinal, 20% (vinte por cento) do preço da arrematação e o saldo restante Nº prazo impreterível de 08 (oito) dias.
O lance mínimo para a venda, será o valor do crédito hipotecário, acrescido de seus acessórios, sujeito porém, este valor, a atualização até 24 (vinte e quatro) horas antes da realização da Praça. Ao valor da arrematação serão acrescidos os eventuais débitos fiscais em atraso. A Leiloeira acha-se habilitada a fornecer, aos interessados, as informações pormenorizadas sobre os imóveis.
Não havendo licitantes ao Primeiro Público Leilão, será realizada a Segunda Praça, nos prazos e termos da legislação pertinente.
Informamos aos candidatos na aquisição do(s) imóvel(eis), objeto(s) do presente Edital, que a CAIXA fornecerá através de sua rede de Agências, se solicitada, CARTAS DE CRÉDITO para financiamento, bem como que os recursos advindos da conta vinculada ao FGTS, poderão ser utilizados para o mesmo fim.

01 - BENEDITO RODRIGUES PINHEIRO - CIC/MF:081.398.812-87
ARACY TEIXEIRA PINHEIRO - CIC/MF:071.355.302-25
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.401, Bl."G", Belém/PA. Área privativa: 83,35m2. Área comum:42,05m2. Área total:125,49m2. Divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 61.638,71**
02 - CAETANA REGINA FONSECA DE ABREU - CIC/MF:064.068.742-34
JOÃO PINTO CORAL NETO - CIC/MF:118.141.282-04
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.401, Bl."A", Belém/PA. Área privativa: 83,35m2. Área comum:42,05m2. Área total:125,49m2. Divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 58.515,28**
03 - CIMARA HELENA MODESTO DA SILVA - CIC/MF:062.085.922-91
Tv. Enéas Pinheiro, Nº.1404, Edf. ALABASTRO, Apto.1302, Belém/PA. Área Privativa: 90,50m2. Área Comum: 40,23m2 e Área Total de 141,98m2. Divisões internas: sala de estar/jantar, três dormitórios, duas sacadas, três banheiros, cozinha, área de serviço e uma vaga de garagem. **SALDO DEVEDOR: R$ 107.253,90**
04 - DÉLIO DA SILVA BARROSO - CIC/MF:394.892.057-53
MARICEA BARBOSA PINTO BARROSO - CIC/MF:394.892.057-53
Rod. Br.316, Km.03, Conj. Resid. DENIZE MELLO, Apto.207, Bloco "K", Ananindeua/PA. Área Privativa: 52,14m2. Área Comum: 46,02m2 e Área Total de 98,16m2. Divisões internas: sala de estar, dois quartos, copa-cozinha, um banheiro e uma área de serviço. **SALDO DEVEDOR: R$ 99.164,86**
05 - FRANCISCA DAS CHAGAS FONSECA CARVALHO - CIC/MF:045.161.502-63
JOSÉ CAMBRAIA CARVALHO - CIC/MF:096.696.472-15
Rod. Augusto Montenegro, Parque Resid. CASTRO MOURA, Qd."G", Casa 08, Tipo H1-2Q-T, Belém/PA. Área Construída: 250,00m2. Área Total: 56,12m2. Divisões internas: sala, dois quartos, cozinha e banheiro. **SALDO DEVEDOR: R$ 42.617,23**
06 - JACQUELINE GUALBERTO OSÓRIO - CIC/MF:248.441.952-04
Trav. do Chaco, Nº.729, Edf. RESIDENCIAL RIO TEJO, Apto.302, Tipo 01, Belém/PA. Área Privativa: 89,63m2. Área Comum: 52,17m2 e Área Total de 141,80m2. Divisões internas: varanda, sala de estar/jantar, dois dormitórios, sendo uma suíte, um estar íntimo, cozinha, área de serviço, deposito, banheiro social, banheiro de serviço e uma vaga de garagem. **SALDO DEVEDOR: R$ 283.949,30**
07 - JOÃO MARIA DE SENA RODRIGUES - CIC/MF:086.731.012-04
MARIA STÉLLA VIANNA RODRIGUES - CIC/MF:144.892.442-15
Trav. Barão do Triunfo, Nº.2154, Cj. Res. ANTÔNIO CARLOS JOBIM, Apto.303, Tipo do Bloco "D", Belém/PA. Área privativa:54,00m2. Área comum: 38,88m2. Área total:92,88m2. divisões internas: sala de estar/jantar: dois quartos, um banheiro, circulação, copa-cozinha e área de serviço.
SALDO DEVEDOR: R$ 89.448,29
08 - JORGE ALVES DA SILVEIRA - CIC/MF:045.333.992-15
Av. João Paulo II, Nº.1426, Edf. GODOY-V, Apto.501, Belém/PA. Área Privativa: 44,16m2. Área Comum: 18,69m2 e Área Total de 62,85m2. Divisões internas: sala de estar/jantar, dormitório com sala de banho, cozinha e uma vaga de garagem. **SALDO DEVEDOR: R$ 115.870,60**
09 - JORGE FERREIRA SOARES - CIC/MF:140.493.842-72
KATYA HELENA PENNER SOARES - CIC/MF:185.955.702-30
Tv. Marques de Herval, Nº.1316, Apto.104, Bl. "C", Resid. VILLA LOBOS, Belém/PA. Área Privativa: 54,00m2. Área Comum: 38,88m2 e Área Total de 92,88m2. Divisões internas: sala de estar/jantar, dois quartos, um banheiro, circulação, copa-cozinha, área de serviço. **SALDO DEVEDOR: R$ 79.078,59**
10 - JOSÉ FERNANDO TORRES VASCONCELOS - CIC/MF:170.723.362-49
LEILA DO SOCORRO LIMA VASCONCELOS - CIC/MF:236.913.102-06
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.303, Bl."B", Belém/PA. Área privativa: 83,35m2. Área comum:42,05m2. Área total:125,49m2. Divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 79.048,11**
11 - JOSÉ FIRMINC GOMES - CIC/MF:056.290.715-72
Rua Haroldo Veloso, Nº.500, também conhecida como Rod. Transcoqueiro Edf. BELA DULCE, Apto.102, Bloco "D", Ananindeua/PA. Área Privativa: 68,48m2, Área Comum:101,60m2 e Área Total de 170,17m2. Divisões internas: sala de estar/jantar, três quartos, copa-cozinha, banheiro social área de serviço e banheiro de serviço. **SALDO DEVEDOR: R$ 58.134,47**
12 - JOSÉ MARTINS GASPAR JUNIOR - CIC/MF:136.032.132-20
MARLY MACEDO MATOS GASPAR - CIC/MF:186.700.082-20
Rod. BR.316, KM.03, Cj. Resid. DENIZE MELLO, Apto.205, Bloco "L", Ananindeua/PA. Área Privativa: 52,14m2. Área Comum: 46,02m2 e Área Total de 98,16m2. Divisões internas: sala de estar, dois quartos, copa-cozinha, um banheiro e uma área de serviço. **SALDO DEVEDOR: R$ 103.491,89**
13 - LAURÉLIO AUGUSTO COUTO DA ROCHA - CIC/MF:098.228.522-15
Rd. BR.316, Km.03, Conj. Resid. DENIZE MELLO, Apto.307, Bloco"L', Ananindeua/PA. Área Privativa: 52,14m2. Área Comum: 46,02m2 e Área Total de 98,16m2. Divisões internas: sala de estar, dois dormitórios, copa-cozinha, um banheiro e uma área de serviço. **SALDO DEVEDOR: R$ 140.308,40**
14 - LUÍS DAVID VASCONCELOS DO VALE - CIC/MF:140.559.452-72
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.301, Bl."F", Belém/PA. Área Privativa: 83,35m2. Área Comum: 42,05m2 e Área Total de 125,49m2. Divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e uma vaga de garagem. **SALDO DEVEDOR: R$ 155.636,32**
15 - MARIA DO PERPETUO SOCORRO ALVES CARDOSO - CIC/MF:083.150.862-00
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.104, Bl."F", Belém/PA. Área privativa: 83,35m2. Área comum:42,05m2. Área total:125,49m2. divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 256.810,23**
16 - NEWTON DE SOUZA CRUZ - CIC/MF:039.854.232-53
REGINA CÉLIA PINHEIRO CRUZ - CIC/MF:176.736.982-42
Tv. São Francisco, Nº.248, Apto.402, Edf. CLAIR DE LUNE, Belém/PA. Área Privativa: 146,34m2. Área Comum: 92,36m2 e Área Total de 238,70m2 Divisões internas: sala de estar/jantar, sala de estar íntimo, varanda três quartos sociais, um banheiro social, lavabo, circulação, copa-cozinha, banheiro e quarto de empregada, com direito a uma vaga de garagem. **SALDO DEVEDOR: R$ 177.306,83**
17 - OLYMPIO IGLESIAS DUARTE MOREIRA - CIC/MF:000.366.762-68
ODAISA ÂNGELA VILLAS MOREIRA - CIC/MF:000.366.762-68
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.304, Bl."B", Belém/PA. Área privativa: 83,35 m2. Área comum:42,05m2. Área total:125,49m2. divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 105.620,89**
18 - PAULO ROBERTO DA SILVA MATNI - CIC/MF:094.960.252-34
TEREZA CRISTINA DIAS MATNI - CIC/MF:032.990.582-15
Rua Haroldo Veloso, também conhecida como Rod. Transcoqueiro, Edf. BELA DULCE, Apto.301, bloco "C", Ananindeua/PA. Área Privativa: 68,48m2. Área Comum: 101,69m2 e Área Total de 170,17m2. Divisões internas: sala de estar/jantar, três dormitórios, copa-cozinha, banheiro social, área de serviço e WC. **SALDO DEVEDOR: R$ 101.549,77**
19 - RUY GUILHERME PACHECO QUARESMA - CIC/MF:257.157.472-87
LÚCIA CRISTINA AZEVEDO QUARESMA - CIC/MF:392.635.682-00
Av. Pedro Miranda Nº.1807, Edf. DENEB, Apto.702, Belém/PA. Área Privativa: 73,57m2. Área Comum: 35,16m2 e Área Total de 119,98m2. Divisões internas: sala, dois quartos, cois banhos sociais, cozinha, hall de entrada, área de serviço, banho de serviço, varanda, quarto de serviço e uma vaga de garagem. **SALDO DEVEDOR: R$ 75.873,31**
20 - SANDRA SUELY CARNEIRO PECK - CIC/MF:128.176.782-49
Passagem Nossa Senhora das Graças, Nº.106, entre a Passagem Bom Jesus e a Tv. Segunda de Queluz - Terra Firme, Belém/PA. Área Total: 176,55m2. Área Construída: 130,01m2. Divisões internas: pátio, varanda, duas salas, circulação, três quartos, banheiro social e copa-cozinha. **SALDO DEVEDOR: R$ 34.516,95**
21 - SEBASTIÃO ANDRADE MENEZES - CIC/MF:031.705.512-72
MARIA DAS GRAÇAS TEIXEIRA MENEZES - CIC/MF:057.932.702-72
Av. Almirante Barroso, Passagem Bartolomeu Gusmão, Casa Nº.93, Lote 07, Quadra 02, Belém/PA. Área Total: 145,20m2. Área Construída: 100,00m2. Divisões internas: pátio coberto, dois dormitórios, copa-cozinha, sala de banho, suíte com banheiro, área livre descoberto, lavanderia, dor
mitório de empregada e WC de serviço. **SALDO DEVEDOR: R$ 6.721,03**
22 - SÉRGIO RAIMUNDO PAES DE OLIVEIRA - CIC/MF:116.037.982-34
MICHELLE CÂMARA SANTOS DE OLIVEIRA - CIC/MF:116.037.982-34
Tv. Enéas Pinheiro, Nº.1404, Edf. ALABASTRO, Apto.703, Belém/PA. Área Privativa: 90,50m2. Área Comum: 40,23m2 e Área Tota de 141,98m2. Divisões internas: sala de estar/jantar, três dormitórios, duas sacadas, três banheiros, cozinha, área de serviço e uma vaga de garagem. **SALDO DEVEDOR: R$ 86.354,01**
23 - TIAGO LAURIDO PEREIRA - CIC/MF:110.833.362-15
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.402, Bl."G", Belém/PA. Área privativa: 83,35m2. Área comum:42,05m2. Área total:125,49m2. Divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 51.067,68**
24 - YASUO NUMAZAWA - CIC/MF:055.823.852-15
Rod. Augusto Montenegro, Km.21, Tv. Alacid Nunes, 3421, Cj. Resid. Vila Nazareno (Tenone), Apto.103, Bl."C", Belém/PA. Área privativa: 83,35m2. Área comum:42,05m2. Área total:125,49. divisões internas: sala de estar/jantar com sacada frontal, um quarto, uma suíte, sala de banho social, cozinha, área de serviço, WC de serviço, dormitório de empregada e vaga de estacionamento. **SALDO DEVEDOR: R$ 74.174,85**

BANCO DA AMAZÔNIA — BASA — **GOVERNO FEDERAL**

Aviso de Licitação

O Banco da Amazônia S.A. comunica aos interessados que fará realizar licitação, na modalidade Concorrência, de nº 1999/022, de tipo "menor preço por item", para registro de preços objetivando a aquisição de 96 caixas de cartuchos de toner preto e 36 caixas de cartuchos toner verde, ambos para impressora a laser marca XEROX - 4890. Abertura em 22.11.1999
O edital completo poderá ser obtido no COMLIC, fone (91) 216-3308/fax (91) 222-7244. Disponível, também, na internet, no endereço: http:/www. bancoamazonia. com.br.

COMITÊ DE LICITAÇÕES

PODER JUDICIÁRIO
SEÇÃO JUDICIÁRIA DO PARÁ
JUÍZO FEDERAL DA QUINTA VARA
Rua Domingos Marreiros, 598-Umarizal
CEP: 66.055-210 Telefax: 222-6319
EDITAL DE LEILÃO
Prazo: 30 dias

O Doutor **JOÃO BATISTA RIBEIRO**, Juiz Federal da Quinta Vara, torna público que será realizado o seguinte leilão no processo em que é exeqüente o **INSTITUTO NACIONAL DE COLONIZAÇÃO E REFORMA AGRÁRIA** - INCRA. DATAS, HORA E LOCAL: dias 08/01 e 28/01/99, às 15:00 horas, Rua Domingos Marreiros nº 598, Umarizal, Belém-Pa.
PROCESSO: 92.0003473-0
EXECUTADO: SINDICATO DOS TRABALHADORES DO SERVIÇO PÚBLICO FEDERAL NO ESTADO DO PARÁ - SINTSEP
BEM: direito ao uso do terminal telefônico prefixo 2460088 contrato TPA 1408208, avaliado em R$ 1.100,00 (mil e cem reais).
NOTAS:
1- O bem será arrematado pela maior oferta.
2- Não será aceito lanço inferior a 70% do valor do bem.
3- Cabe ao arrematante pagar a comissão legal do leiloeiro.
Belém-Pa, 4 de novembro de 1998.
JOÃO BATISTA RIBEIRO
Juiz Federal da Quinta Vara

BRASIL MONTEIRO ADVOCACIA

ESCRITÓRIO DE ADVOCACIA FRANCISCO BRASIL MONTEIRO S/C

Preposto do Agente Fiduciário **BANPARÁ S/A**
Credor: **Caixa Econômica Federal**

NOTIFICAÇÃO EXTRAJUDICIAL

Pelo presente e por estarem em lugar incerto e não sabido, ficam os abaixo relacionados, notificados para ciência, de que estamos autorizados, na forma do Decreto-Lei Nº. 70 de 21/11/1966 e Regulamentação Complementar, a promover a Execução Extrajudicial das respectivas hipotecas que oneram os imóveis de que são proprietários, os abaixo referidos.
Ficam, portanto, cientes de que tem o prazo de 20 (vinte) dias contados a partir da primeira publicação desta, em 11/10/1999, para, querendo, purgarem o débito e evitarem a execução, o que poderá ser feito na Trv. Almirante Wandenkolk Nº. 1243, sala 901, bairro do Umarizal, Belém/PA, diariamente, exceto aos sábados e domingos, no horário das 08:00 as 18:00 horas, ou então em qualquer Agência da **CAIXA ECONÔMICA FEDERAL.**

01) C.H. Nº. 3.1972.0001704-2
ANA SUELI RODRIGUES CAVALCANTE - CIC/MF Nº. 049.040.362-04
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-8", Aptº. 206, Nova Marambaia, Belém/PA.
02) C.H. Nº. 3.1972.0001844-8
ANTÔNIO CARLOS RILLO SILVA - CIC/MF Nº. 405.773.411-20
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-10", Aptº. 103, Nova Marambaia, Belém/PA.
03) C.H. Nº. 3.1972.0001866-9
DANIEL SILVA DA SILVA - CIC/MF Nº. 256.085.502-00
KEILA MATOS DA SILVA - CIC/MF Nº. 373.582.602-44
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-1", Aptº. 305, Nova Marambaia, Belém/PA.
04) C.H. Nº. 3.1972.0001523-6
DEOCLECIANO FELICIANO HOLANDA - CIC/MF Nº. 065.677.168-27
MARLUCE BASTOS HOLANDA - CIC/MF Nº. 192.161.732-20
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-4", Aptº. 101, Nova Marambaia, Belém/PA.
05) C.H. Nº. 3.1972.0001789-1
DIRCE DE SOUZA NASCIMENTO - CIC/MF Nº. 000.848.322-15
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-10", Aptº. 107, Nova Marambaia, Belém/PA.
06) C.H. Nº. 3.1972.0001647-0
EDNA MARIA NASCIMENTO LOPES - CIC/MF Nº. 091.814.909-91
ELDONOR DE ALMEIDA LOPES - CIC/MF Nº. 161.888.375-53
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-1", Aptº. 306, Nova Marambaia, Belém/PA.
07) C.H. Nº. 3.1972.0001713-1
ELZENILSON MONTEIRO NASCIMENTO - CIC/MF Nº. 129.705.572-15
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "C-3", Aptº. 208, Nova Marambaia, Belém/PA.
08) C.H. Nº. 3.1972.0001399-3
EVANDRO ARAÚJO BRASIL - CIC/MF Nº. 025.657.222-49
CLAUDETE DE FÁTIMA SANTOS BRASIL - CIC/MF Nº. 193.910.722-91
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09) C.H. Nº. 3.1972.0001413-2
FRANCISCO CAMILO LUIZ ALBUQUERQUE SIDOU - CIC/MF Nº. 134.005.502-30
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-5", Aptº. 402, Nova Marambaia, Belém/PA.
10) C.H. Nº. 3.1972.0001528-7
FRANCISCO CARLOS DE SOUZA ASSUNÇÃO - CIC/MF Nº. 099.227.682-91
ELENILDES ALVES ASSUNÇÃO - CIC/MF Nº. 248.619.602-15
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-4", Aptº. 308, Nova Marambaia, Belém/PA.
11) C.H. Nº. 3.1972.0001953-3
GERSULITA MARQUES PINHEIRO - CIC/MF Nº. 082.174.752-53
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-5", Aptº. 104, Nova Marambaia, Belém/PA.
12) C.H. Nº. 3.1972.0001893-6
GILMAR GUILHERME SARAIVA - CIC/MF Nº. 089.988.252-87
MARIA VIANEI DE ANDRADE SARAIVA - CIC/MF Nº. 255.342.972-04
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-7", Aptº. 207, Nova Marambaia, Belém/PA.
13) C.H. Nº. 3.1972.0001625-9
JANIO LUIZ FERREIRA VIANA - CIC/MF Nº. 249.512.342-20
CREMILDA MARIA FERREIRA VIANA - CIC/MF Nº. 065.807.002-97
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-1", Aptº. 104, Nova Marambaia, Belém/PA.
14) C.H. Nº. 3.1972.0001778-6
JOÃO BATISTA LOPES FREIRE FILHO - CIC/MF Nº. 122.353.000-78
ELIANE MONTEIRO FREIRE - CIC/MF Nº. 108.590.202-15
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "C-3", Aptº. 303, Nova Marambaia, Belém/PA.
15) C.H. Nº. 3.1972.0001988-6
JORGE LUIZ CALICE AUAD - CIC/MF Nº. 118.084.202-25
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-2", Aptº. 302, Nova Marambaia, Belém/PA.
16) C.H. Nº. 3.1972.0001871-5
JOSÉ EDIR MEIRELES DE CARVALHO - CIC/MF Nº. 084.245.192-72
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-6", Aptº. 306, Nova Marambaia, Belém/PA.
17) C.H. Nº. 3.1972.0001928-2
JOSÉ LUIZ AGUIAR ALBUQUERQUE - CIC/MF Nº. 032.877.852-49
NILMA DE SÁ ALBUQUERQUE - CIC/MF Nº. 032.877.852-49
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-8", Aptº. 304, Nova Marambaia, Belém/PA.
18) C.H. Nº. 3.1972.0001440-0
JOSÉ MARIA DE OLIVEIRA CACELA - CIC/MF Nº. 011.264.072-91
NANCI PENHA CACELA - CIC/MF Nº. 011.264.072-91
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-1", Aptº. 202, Nova Marambaia, Belém/PA.
19) C.H. Nº. 3.1972.0001989-4
LUIZ CLÁUDIO ALBUQUERQUE LEÃO - CIC/MF Nº. 263.858.642-00
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-7", Aptº. 202, Nova Marambaia, Belém/PA.
20) C.H. Nº. 3.1972.0001806-5
LUIZ PASQUATO EMMANOELLI - CIC/MF Nº. 197.751.480-49
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-9", Aptº. 402, Nova Marambaia, Belém/PA.
21) C.H. Nº. 3.1972.0001833-2
MARCOS ANTÔNIO PINTO COHEN - CIC/MF Nº. 166.500.692-72
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22) C.H. Nº. 3.1972.0001804-9
MARIA DAS GRAÇAS SILVA CARNEIRO - CIC/MF Nº. 055.839.262-87
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-4", Aptº. 401, Nova Marambaia, Belém/PA.
23) C.H. Nº. 3.1972.0001949-5
MARIA DE NAZARÉ DE ALMEIDA CRUZ - CIC/MF Nº. 118.354.512-68
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-6", Aptº. 102, Nova Marambaia, Belém/PA.
24) C.H. Nº. 3.1972.0001715-8
PAULO OTÁVIO BASTOS BAKER - CIC/MF Nº. 083.340.412-00
MARILENE LEITÃO BAKER - CIC/MF Nº. 083.340.412-00
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-2", Aptº. 206, Nova Marambaia, Belém/PA.
25) C.H. Nº. 3.1972.0001777-8
RAIMUNDO AGUINALDO DA CRUZ OLIVEIRA - CIC/MF Nº. 725.061.487-87
ELIANA NUNES OLIVEIRA - CIC/MF Nº. 197.676.412-20
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-7", Aptº. 305, Nova Marambaia, Belém/PA.
26) C.H. Nº. 3.1972.0001984-3
RAIMUNDO NONATO CAMARA - CIC/MF Nº. 059.563.743-49
ZENITH MATOS CAMARA - CIC/MF Nº. 771.631.507-25
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-7", Aptº. 102, Nova Marambaia, Belém/PA.
27) C.H. Nº. 3.1972.0001597-0
RICARDO RAMOS FILHO - CIC/MF Nº. 012.496.062-68
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-4", Aptº. 201, Nova Marambaia, Belém/PA.
28) C.H. Nº. 3.1972.0001836-7
ROSEMIRO DE SOUSA SOARES - CIC/MF Nº. 037.337.262-00
SAFIRA DA COSTA SOARES - CIC/MF Nº. 069.457.592-53
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-6", Aptº. 405, Nova Marambaia, Belém/PA.
29) C.H. Nº. 3.1972.0001790-5
SÔNIA MARIA LOSADA MAIA - CIC/MF Nº. 227.811.532-49
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS"; Bloco "D-2", Aptº. 305, Nova Marambaia, Belém/PA.
30) C.H. Nº. 3.1972.0001403-5
TEREZINHA DO SOCORRO LEMOS NOBRE - CIC/MF Nº. 134.912.102-91
MANOEL JORGE NOBRE DO ESPIRITO SANTO - CIC/MF Nº. 159.481.102-49
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "A-8", Aptº. 103, Nova Marambaia, Belém/PA.
31) C.H. Nº. 3.1972.0001897-9
VÂNIA LÚCIA BUARQUE DE GUSMÃO - CIC/MF Nº. 045.176.442-00
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-8", Aptº. 106, Nova Marambaia, Belém/PA.
32) C.H. Nº. 3.1972.0001848.0
VÂNIA LÚCIA REIS CÂMARA - CIC/MF Nº. 028.986.402-04
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "B-2", Aptº. 307, Nova Marambaia, Belém/PA.
33) C.H. Nº. 3.1972.0001829-4
VICENTE RODRIGUES DOS SANTOS - CIC/MF Nº. 085.908.932-00
Endereço: Rodovia Augusto Montenegro, Conjunto Residencial "NATÁLIA LINS", Bloco "D-5", Aptº. 304, Nova Marambaia, Belém/PA.