

Ingyendo nshakisha z'Anselimi Lanturulu

MILIYARIDI iGIHUMBI Z'AMAZUBA

Johani-Petero Petit

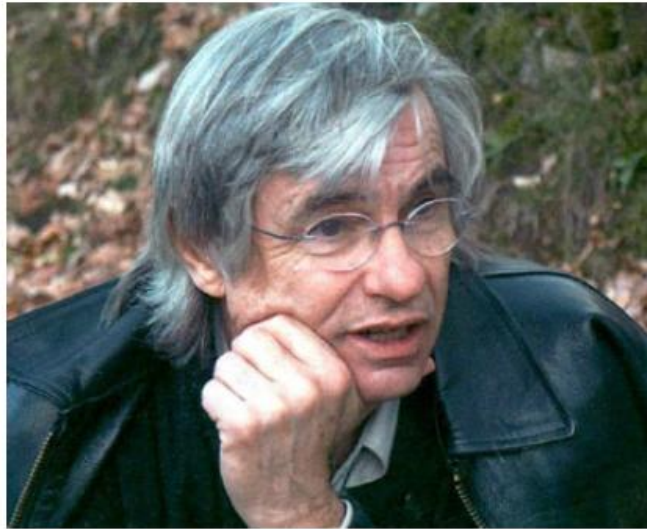
Byahinduwe na:
Mohamed Abdel aziz Kamanzi

Umunsi umwe, Imana yisukiye
kawo mu gikombe, hanyuma iriho
ivanga ikoresheje ikiyiko,...



Ubumenyi butagira Imipaka

Itegeko ryo mu 1901 rigenga amashyirahamwe



Jean-Pierre Petit, Perezida w'iri Shirahamwe

Uyu Jean-Pierre Petit, Peresida w'iri shyirahamwe ry'Ubumenyi butagira Imipaka, yahoze ari diregiteri w'ubushakashatsi mu kigo cy'inzobere cya CNRS, mu Bufaransa. Akaba kandi inzobere ihanitse muri Fizike y'inyenyeri (Asitorofizike); yahimbye uburyo bushyashya by'inyandiko bita: *Ibitabo by'amashusho by'ubumenyi*. "Ubumenyi butagira Imipaka" ni ishyirahamwe ryahimbwe mu 2005 n'abagabo babiri, Jean-Pierre Petit na mugenzi we Gilles d'Agostini. Iri shyirahamwe ryihaye intego yo gukwirakwiza kw'isi hose ubumenyi ku buntu harimwo n'ubumenyi bwa tekhnike, ubukorikori n'ikoranabuhanga. Iri shyirahamwe ribeshejweho n'inkunga rihabwa. Izo nkunga nizo ziriha abantu bahindura inyandiko mu zindi ndimi. Buri nyandiko (igitabo cy'amashusho cy'ubumenyi) ihindurirwa mu rundi rurimi ku mafaranga angana n'amayero 150 (150 euros) kuva mu 2007 kugeza ubu. Iri shyirahamwe rinariha amafaranga ajyanye n'iyoherezwa ucishije muri banke ry'ayo mafaranga y'ihinduranya mu zindi ndimi. Abahinduranyi b'indimi bagiye bongera, buri munsu, umubare w'ibyo bitabo bisomwa hose k'ubuntu. (Nko kugeza mu 2007, hari hamaze kuboneka ibitabo magana abiri (200) bikurwa kuri interineti k'ubuntu kandi byanditse mu ndimi makumyabiri n'umunani (28) harimwo ikinyarwanda n'ururimi rwo muri Lawosi).

Biremewe ko iki gitabo gikopororwa cyangwa gifotorwa, cyose cyangwa igice; kinakoreshwa n'abarimu mu masomo ariko mu buryo butari uburya inyungu z'amafaranga. Gishobora gushyirwa mu masomero y'uturere, y'amashuri cyangwa ya za kaminuza, cyanditse ku mpapuro cyangwa cya shyizwe mu miyoboro y'imbuga z'ikoranabuhanga zigose (intranet).

Uyu mwanditsi w'ibi bitabo yatangiye kwandika ibindi byo byoroshye kandi bigenewe abana bato (bari mu rugero rw'imyaka 12). Ibindi biriho bikorwa n'ibitabo by'amajwi avuga, bigenewe abatazi gusoma cyangwa abashaka kwiga urundi rurimi rutari urwo bakuriyemwo.

Iri shyirahamwe rishaka buri gihe abahinduranyi b'inyandiko bazishyira mu ndimi zabo zakavukire ariko bafite ubuhanga buhagije bwo gutanga inyandiko mpiduranyi nziza z'ibitabo basomye.

Ushatse kugira icyo ubaza cyangwa ugeze kuri iri shyirahamwe, wajya ku rubuga rwaryo ku interinete aha hakurikira: <http://www.savoir-sans-frontieres.com>

Iranga-konti mu Bufaransa → Inyandiko ngaragaza mutungo muri (RIB)

Ikigo	Umwanya wo kwakiriramwo amafaranga	Nimero ya konti	Urufunguzo rwa RIB
20041	01008	1822226V029	88

Aho ikorera: Banki ya Posita
Hagati y'Umujyi wa Marseille
13900 Marseille CEDEX 20
Mu Bufaransa

Mu bindi bihugu → Ibanki Mpuzamahanga (International Bank) Nimero ya Konti (IBAN):

IBAN
FR 16 20041 01008 1822226V029 88

→ N' Inyandikobanga ya banki (BIC) :


BIC
PSSTFRPPMAR

Amategako agenga iri shyirahamwe agaragara ku rubuga rwa yo kuri interineti. Imibare ngaragaza mutungo nayo irahari kandi ihora ishyirwa ku gihe. Iri shyirahamwe nta mafaranga na make rikura ku nkunga rihawe uretse ayo kohereza, bicishijwe muri banki, ahemba abahinduranyi b'indimi ku buryo babona abagenewe yose. Nta munyamuryango w'iri shyirahamwe n'umwe rihemba kuko bose ari abakoranabushake.

Abanyamuryango ubwabo nibo barihira amafaranga ishyirahamwe rikoresha ngo ribeho nk'ayo kwishyura no gukoresha urubuga rwa yo rwo kuri interineti kuko ayo atarihwa n'ishyirahamwe.

Bityo mugaragarizwa neza uko umutungo w'ishyirahamwe ukoreshwa kandi mukibonera ikizere ko, muri iyo "mirimo y'ubwitange mfashamuco", inkunga yose mutanga ikoreshwa neza mu kwishyura abahindura ibitabo mu zindi ndimi.

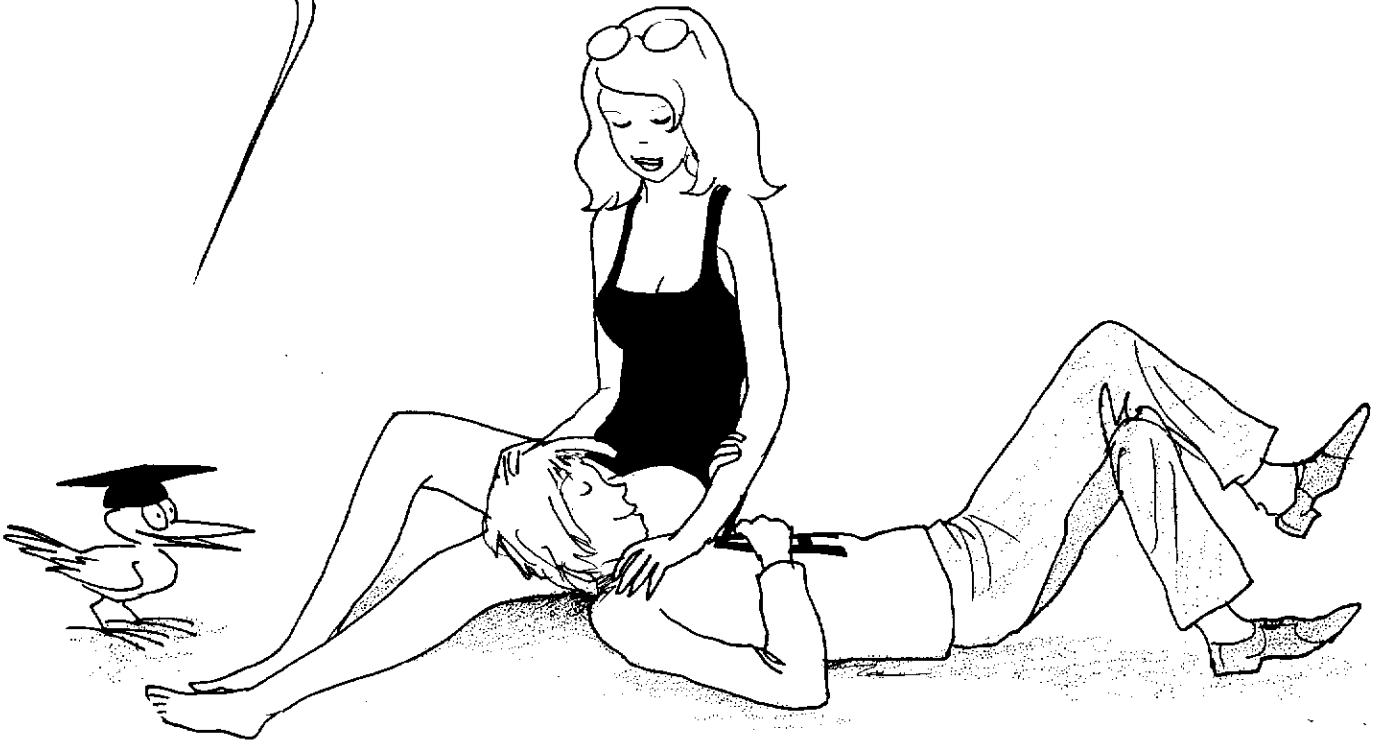
Dushyira ku rubuga rwa interineti buri kwezi, ugereranije, nk'ibitabo cumi bihinduwe mu zindi ndimi.

A black and white cartoon illustration. On the left, a large bird with a long, pointed beak and a small, round object (possibly an egg or a chick) in its beak stands on the ground. A large speech bubble above it contains the text 'Urabizi neza, Tireziyasi, ko ari kibonumwe ya Hale?'. In the center, a small, round, striped animal (possibly a snail or a small turtle) is on the ground. On the right, a small animal with a long tail sits on a tree stump. A speech bubble above it contains the text 'Rwose pe'.

Urabizi neza, Tireziyasi,
ko ari kibonumwe ya Hale ?

Rwose pe

Birashoboka ko iniveri yaba ari
igikorwa kigari k'isakazabumenyi nyasiyanse:
Imana igerageza kutwumvisha ibintu
bimwe na bimwe...



Siyanse yenda ni
iforoma ikoze neza kurusha izindi
y'inyandiko z'amaringo.



IKIHANANGIRIZO

ASITOROFIZIKYE ni siyanse
NSHYASHYA. Kugeza mu myaka ya vuba
abantu babonaga amakuru ya Iniveri
aciye mu KIRAHURE CYANDUYE
CYA ATIMOSIFERI.



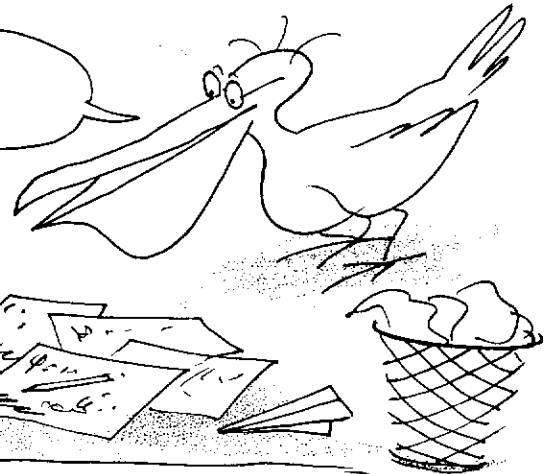
DINAMIKYE NYAGALAGISI
ikomeje gutegereza KEPULERI
cyangwa LAPALASE wa yo.
Kugeza ubu nti tuzi kubonera
igisubizo nyamubare gihamye
sisiteme ya ekwasiyo isobanura
ikintu cyitwa GALAGISI.

Muri icyo domene,
inzobere zisa n'izinyonga
igare mu kivuguto kuva
imyaka irenga ikinyejana!

Ibiramambo, ubwana bwa Iniveri
(BIGI BANGE) burumvikana neza kurusha
ububwirukira bwa yo, bukiri ... ikinyabacu.

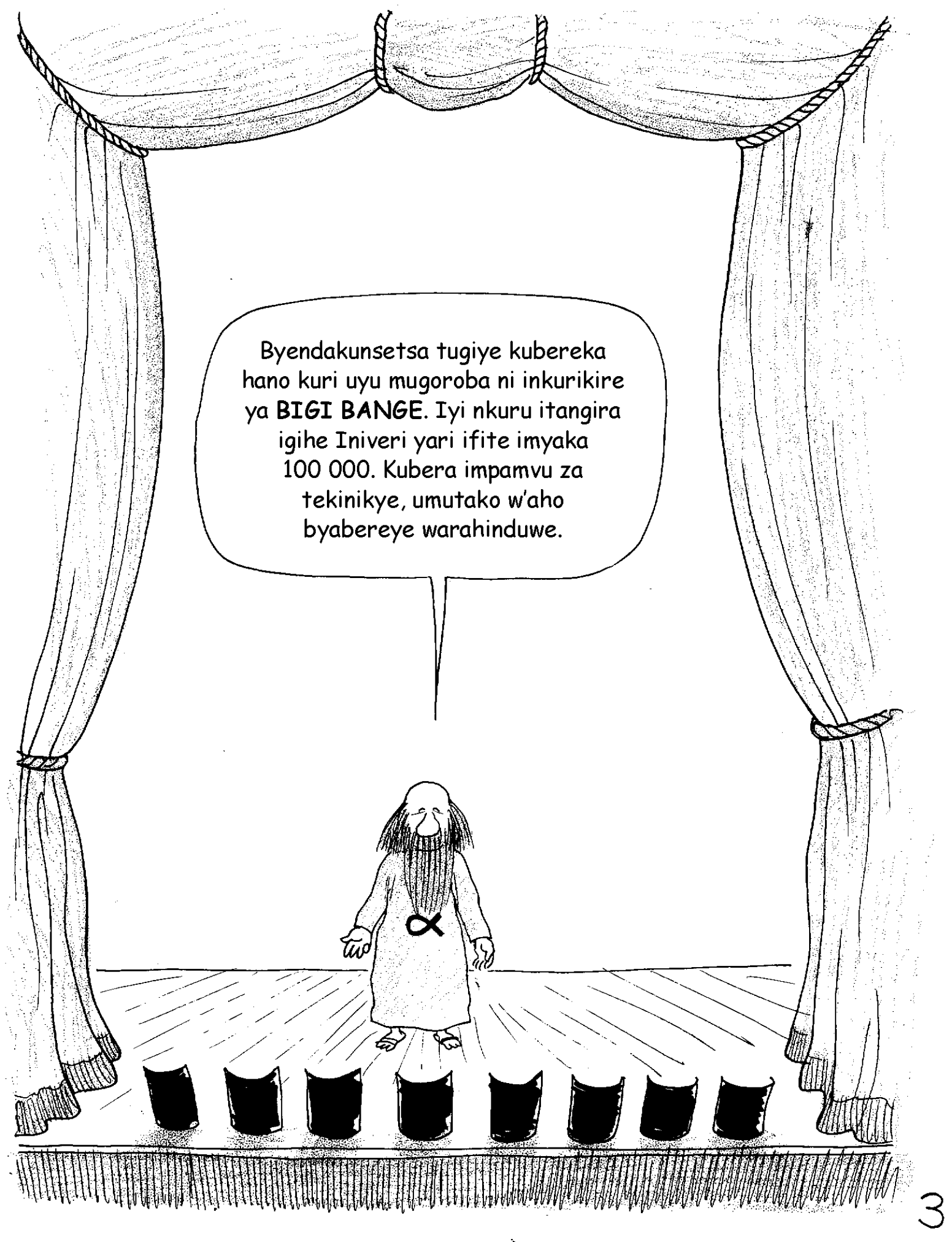
Turacyari kure y'ubwumvikane, kandi amatwari
anyomozanya mu buryu bwigaragaza ariho, avuga
kubijyanye n'ivuka n'ikura ry'ama galagisi.

Amakuru yegeranijwe hakoreshejwe telesikope
nyakirere, akanigwa na zamudasobwa mu zambere
zikomeye cyane, azashobora yenda gutuma abantu
bagira icyo bageraho gihamye, mu minsi iri
imbere.... Ugereraniye yo hafi na hafi.



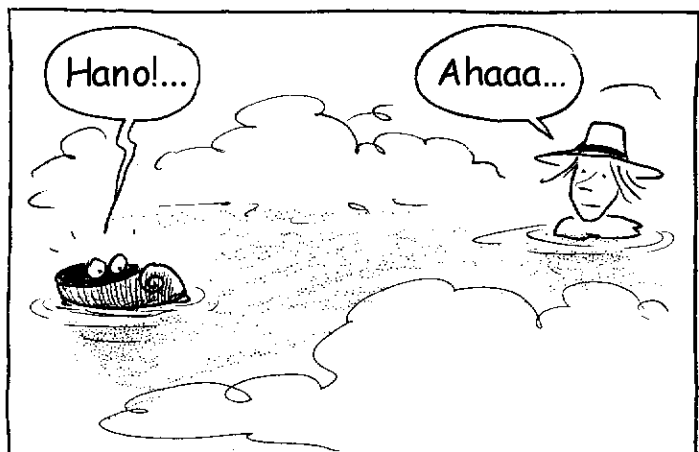
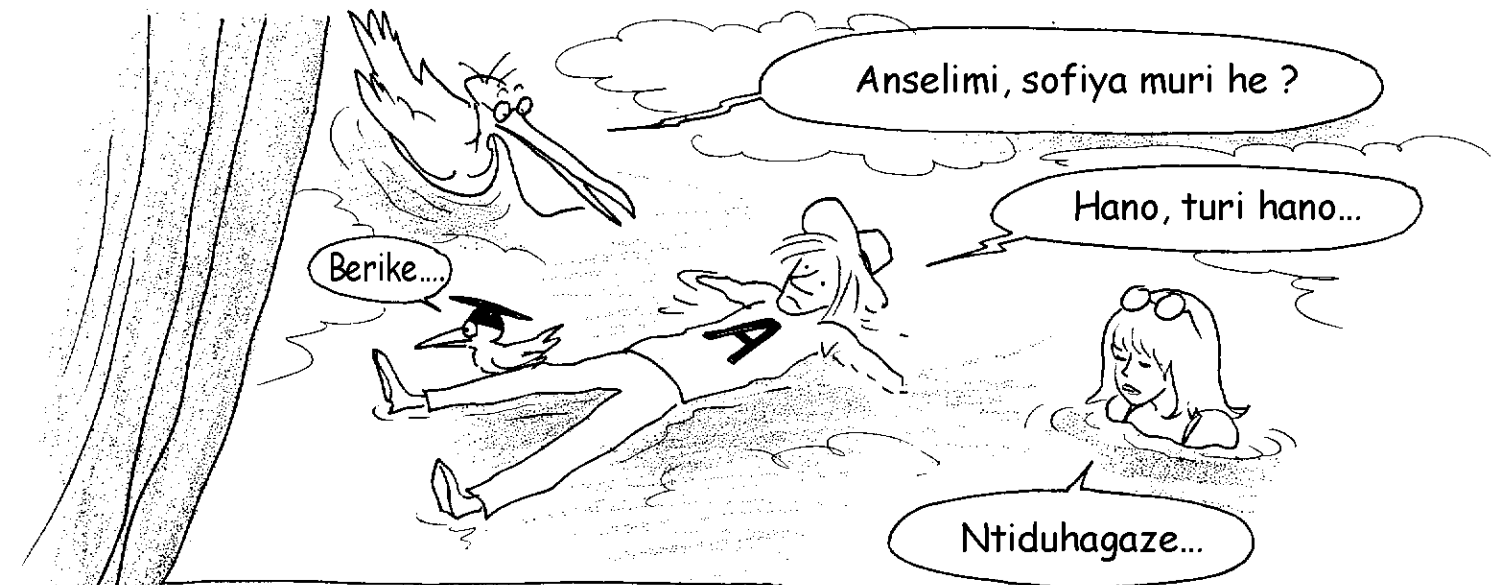
Umwanditsi w'iyi nkuru yagize rero
ibyo ahitamwo ku giti kye. Mu gihe kizaza,
iyi nkuru yenda izagaragara nk'ikusanya
ry'ubumenyi bwashishoje...

Cyangwa rero nk'igitebo cy'ibinyoma.



Byendakunsetsa tugiye kubereka hano kuri uyu mugoroba ni inkurikire ya **BIGI BANGE**. Iyi nkuru itangira igihe Iniveri yari ifite imyaka 100 000. Kubera impamvu za tekinikyeye, umutako w'aho byabereye warahinduwe.

PALANETE INIVERI



Iyo supu, wa musore we, ni MATSIYERI

Ahaa, nongeye kubabona, mwebwe!

Ubwa mbere na mbere roho y'Imana yagenderaga hejuru y'amazi...

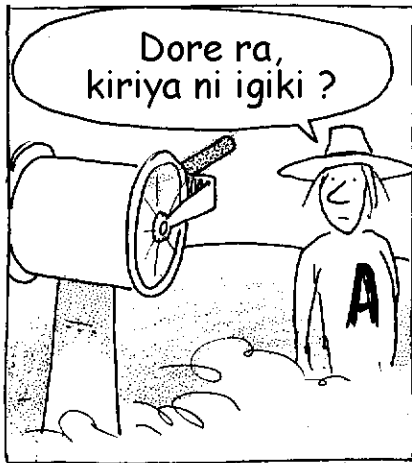
Ningoga...

Hagarikira aho!, wamuhinyuzi we!

Ohu, nimurebe, ni igitangaza!

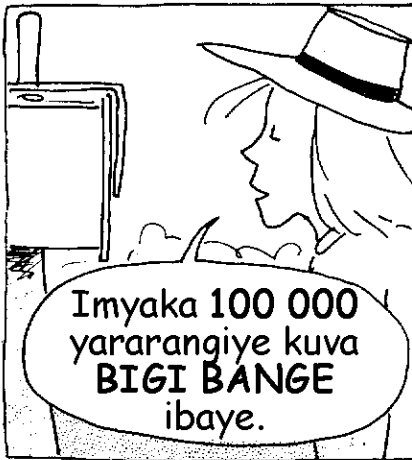
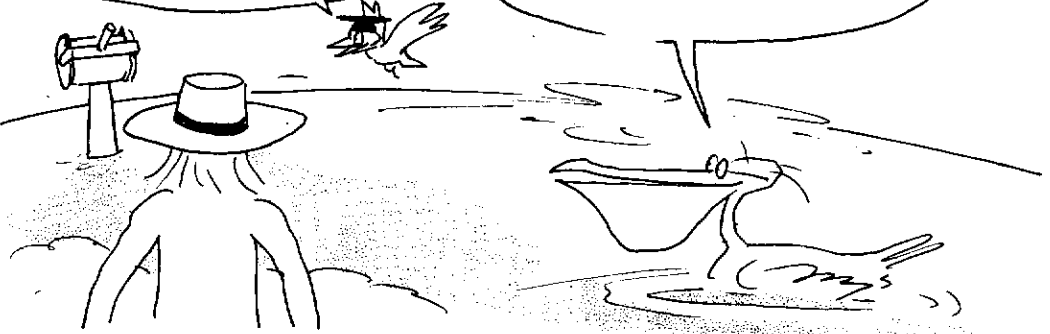
Oya ariko, arahagaze, ni ibyo gusa...

Dore ra, ni ukuri!

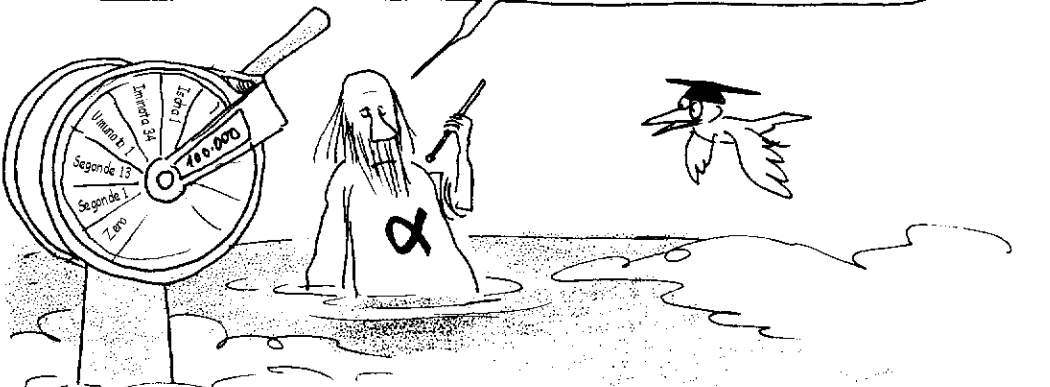


Urabizi neza, ni **KORONOTORONI (*)**

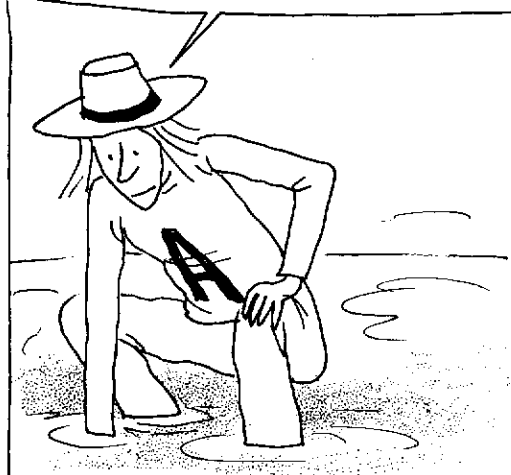
Ni **GIHE** ki uyu munsu ?



Yego, kandi igipimo cy'ubushyuhe bwa Iniveri ni dogere **8000**.

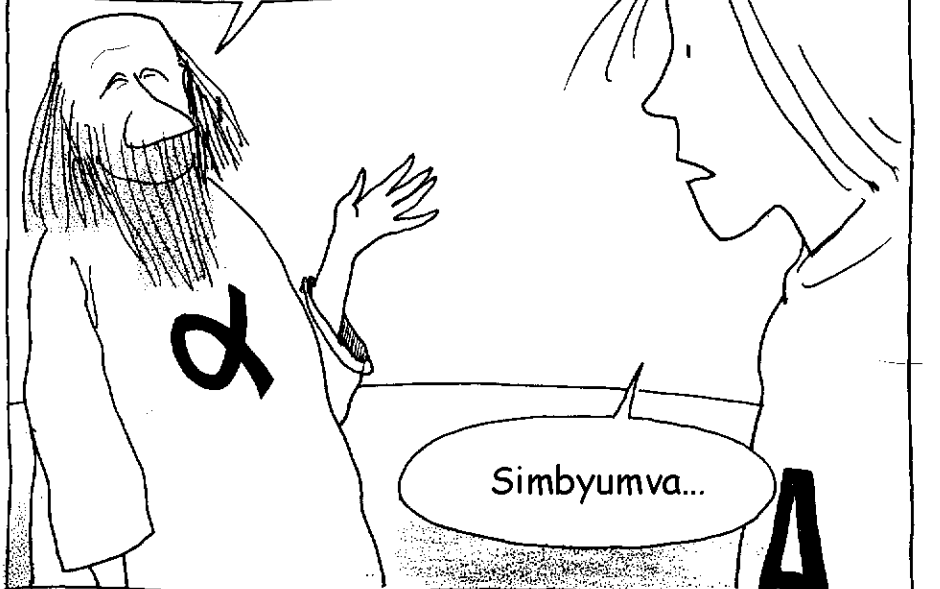


IGITEMBA-MATSIYERI ni amayobera. Wagirango ifashe ku **NDIBA**



Ni **AMAFOTONI, INDIBA** y'UMURASIRE W'IBANZE, NYAKOSIMOSI

Isi iradendeje.



Ariko se iyo **NDIBA** ni iki mu by'ukuri ?

(*) Reba **BIGI BANGE**, icapiro Belini.

Witegereje ubwa mbere,
ese isi iribumbye nk'idenesi ?

Yego, ni ubwoko bw'igipurizo nyasiferi gihora
kibyimba, kibyimba...

Mbega igikonil!...

K'uruhande rwo hejuru,
MATSIYERI yitwara nk'**IGITEMBA**

Ariko se,
mu nsi ni **IKI** ?

Mu nsi, ni **ESIPASE**. Hari esipase
cyane kurusha matsiyeri.

Murashaka kuvuga ko iyi
PALANETE-INIVERI ifukuye ?

Mukobwa mwiza nshuti ya nje,
uzi neza ko **UBUSA**, butabaho. "ubusa
nyakosimosi", mu by'ukuri ni itsinda, ikusanyiro
y'**AMAFOTONI** amwe atsikamiye andi. Ni ama
FOTONI Y'IBANZE yaremwe igihe cya **BIGI
BANGE**. Kuva icyo gihe, hari imiliyaridi imwe ya
yo mafotoni kuri buri paritikile ya matsiyeri.

Mu yandi magambo,
icyo gipurizo nyasiferi kigizwe na
muse **IKWEDUKA**, buri kanogo
kose gaserukira fotoni (*)

MATSIYERI

ESIPASE
= **UMURASIRE**
= **AMA FOTONI**

IKWEDUKA? Mubonako ibyo bikweduka?
Ni umutamenwa nyawo, iriya muse !

Ikomatanyo ry'iyi muse ni
ISUNIKA RY'ISAKARA
Y'UMURASIRE.

(*) diyametero y'akobo ihwanye n'**UBUREBURE BWA ONDE** ya fotoni.

ISUNIKA, ni ikintu
kijyanye n'IBITEMBA, si byo ese ?

Yego, ariko itsinda
rya fotoni, ni kandi gaze,
ifite isunika rya yo...

Ariko se UBUSA, ni itsinda
ry'amafotoni. Birtyo rero,
UBUSA ni GAZE ! Ibyo rero ?...

Mu by'ukuri, MATSIYERI n'UBUSA, ni ukuvuga iyo gaze ya za fotoni z'ibanze,
bikora IMVANJYE INOGEREJE. Ariko, muri uwo mudeli, nimba mbyumva neza,
mwatandukaniye ibyo byicarwo bibiri. ISAKARO Y'IYO PALANETE-INIVERI,
ikora nk'igipurizo, igenda igabanya ISUNIKA RY'ISAKARO RY'UMURASIRE.
Urebeye ahandi kandi umubyimba y' "igitamba-matsiyeri" yigana
MASE NYAVOLIME, nayo kandi igabanuka.

Ese ibyo bibanza
bibiri bikorana bite ?

INJOMBANABIKORWA MATSİYERI IMIRASIRE

Igihe Iniveri yarifite igipimo cy'ubushyuye kiruta
dogere 3000, matsiyeri yari IFATANYE cyane
n'indiba y'umurasire, n'amafotoni y'ibanze.

Ubirebye neza ni
nk'aho matsiyeri yari kuba
"yometse" k'ubusa...

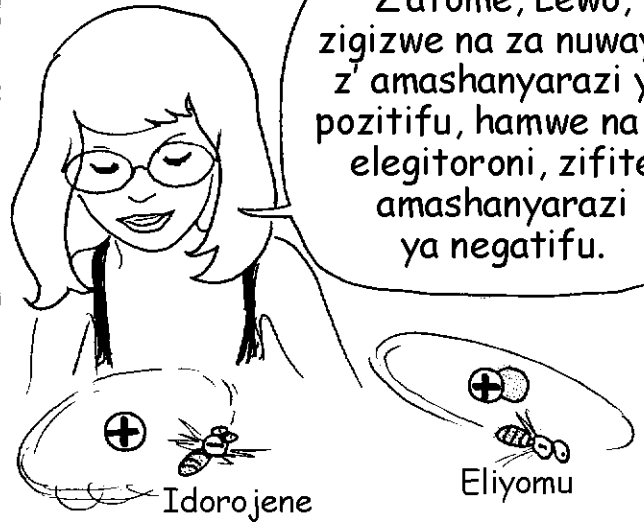
IKI ?

Mu nsi ya dogere 3000, **MATSIYERI** inyerera nta ntambanyi ku ndiba y'**UMURASIRE NYAKOSIMOSI**.

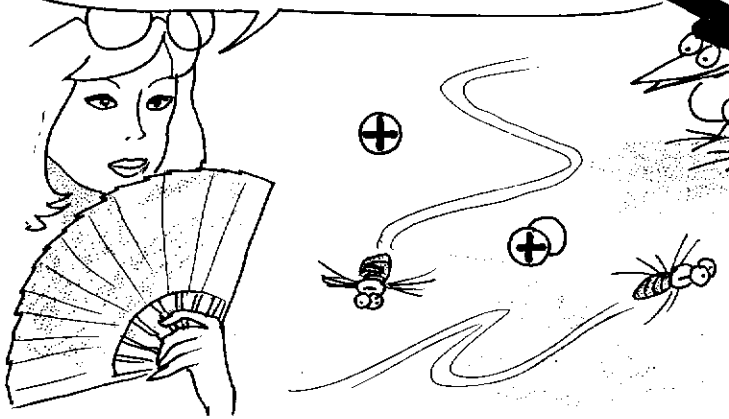


Ariko manyanga we, **KUBERA IKI?**

Z'atome, Lewo, zigizwe na za nuwayo, z' amashanyarazi ya pozitifu, hamwe na za elegitoroni, zifite amashanyarazi ya negatifu.



Hejuru ya dogere 3000, **ITINGISA NYABUSHYUHE** riba rinini cyane, noneho ama **SEKURANA** hagati ya za atome akabuza ama elegitoroni kuzenguruka mu mutuzo iruhande y'amanuwayo.

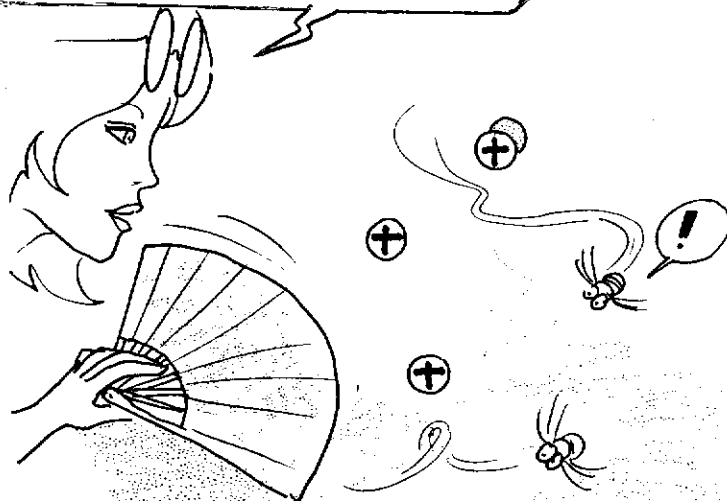


Ama elegitoroni ahita **YIGENGA** noneho hahita havugwa ko **MATSIYERI** ari **IYONIZE**.

Byiza, ariko rero se?



URUMURI ni urugendo nkururane rw'ama **FOTONI** ariko **KANDI** ni na **ONDE NYASUMAKUMASHANYARAZI**, umurari wa esipase.

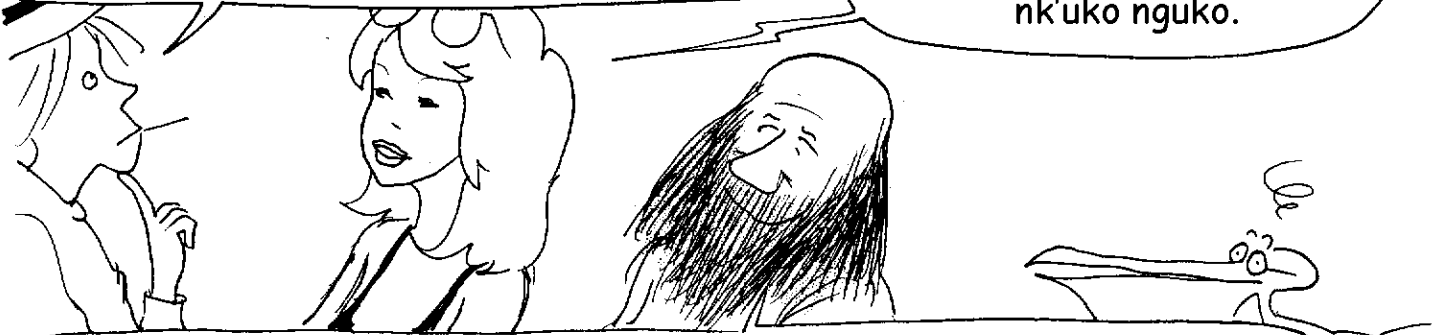


Kandi uwo murari wumvwa cyane n'ama elegitoroni yo afite uburemere bukye ugereranije na za nuwayo zo ziremereye kurushaho.



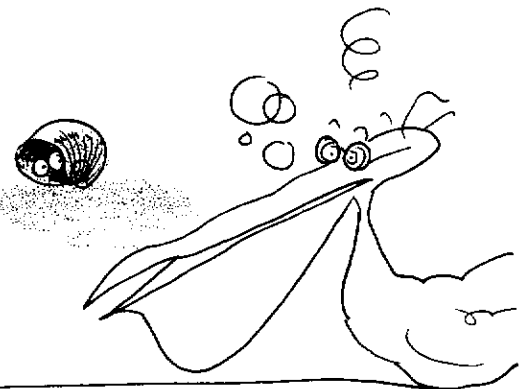
Muri gaze, umurari usakara, uba ari onde nyasunika, (*) onde nyajwi. Urumuri rwaba rero ari onde nya... sunika y'umurasire, yisakaza ku muvuduko wa km 300 000 /s.

Muri gaze, umuvuduko w'itingisa w'utugingo ungana hafi cyane n'umuvuduko w'ijwi. Muri " gaze ya za fotoni", naho ni nk'uko nguko.



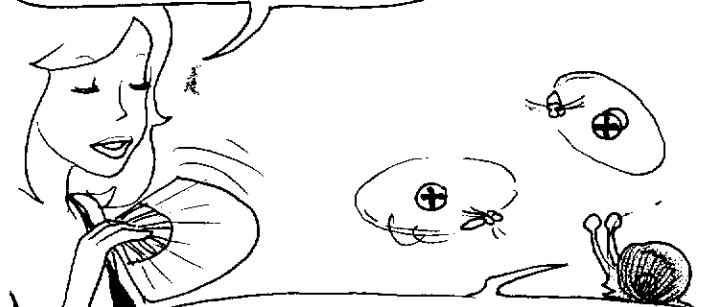
Ndemeza neza ko icyo gaze y'ama fotoni ari bumwe mu buvumbuzi bwa nje bwiza. Muri icyo gihe, ama onde n'ama paritikile BIBA ARI IKINTU KIMWE.

- Yego, reka tubyemere gurtyo:
- 1) **I GAZE IYONIZE** ijombana na " gaze y'ama fotoni".
 - 2) "**UBUSA**" ni mu by'ukuri "gaze ya za fotoni".
 - 3) Ni ukuvuga ko matsiyeri iyonize "ihoma" k'ubusa.



Iyo igipimo cy'ubushyuhe bwa matsiyeri, muri Iniveri, kimanutse kugera munsu ya dogere 3 000, ama elegitoroni afatana n'ama atome noneho bikaba bitakishiturwa cyane n'imirari nyasumakumashanyarazi.

Isano hagati ya **MATSIYERI** n'**INDIBA Y'URUMURI** riroroha noneho z'atome zigashobora kunyerera uko zishatse mu **BUSA**.

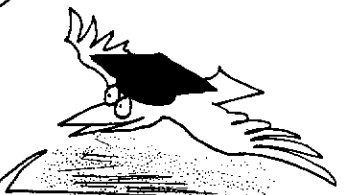


"Zifashwe" n'ama nuwayo.





Muwayi. Ariko mbambwirako muni y'ibirenge byacu hari urufuro, n'utunogo. Simbyumva... amafotoni ntabwo... ari hamwe !?



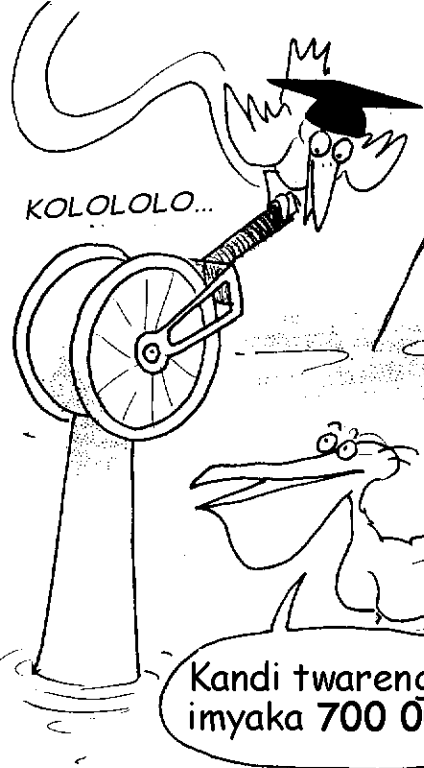
Lewo, ikigaragara kuri ruriya rufuro, ni uko ari uburyo busobanutse bwo kwerekana esipace n'UMURASIRE W'IBAZE uyirimwo.



Byisa, bambwirako UBUSA butabaho. Ariko se kandi nkuyeho za fotoni, hasigara iki?

NTANA KIMWE

UBWIKUBEKABIRI



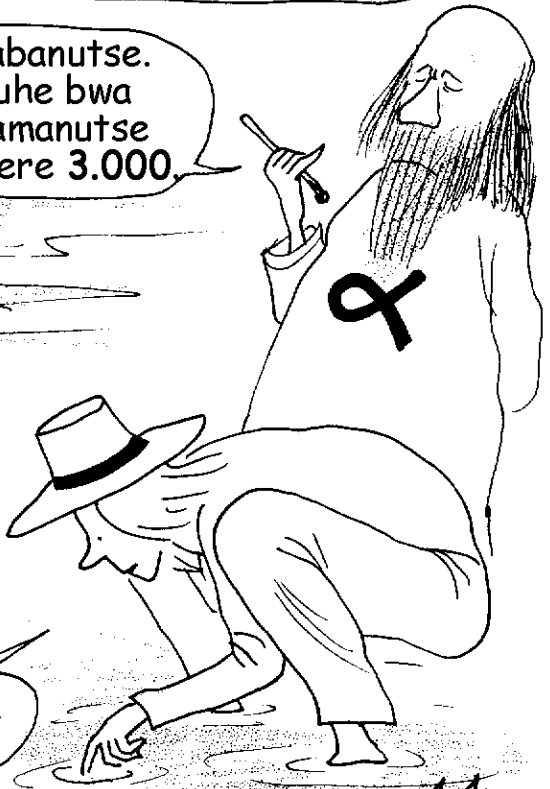
Ehe, wasubiye kwatsa KOLONOTORONI !!

Yewe, igipimo cyagabanutse. Igipimo cy'ubushyuhe bwa MATSIYERI cyaramanutse kugera mu nsi ya dogere 3.000.

Baravo !

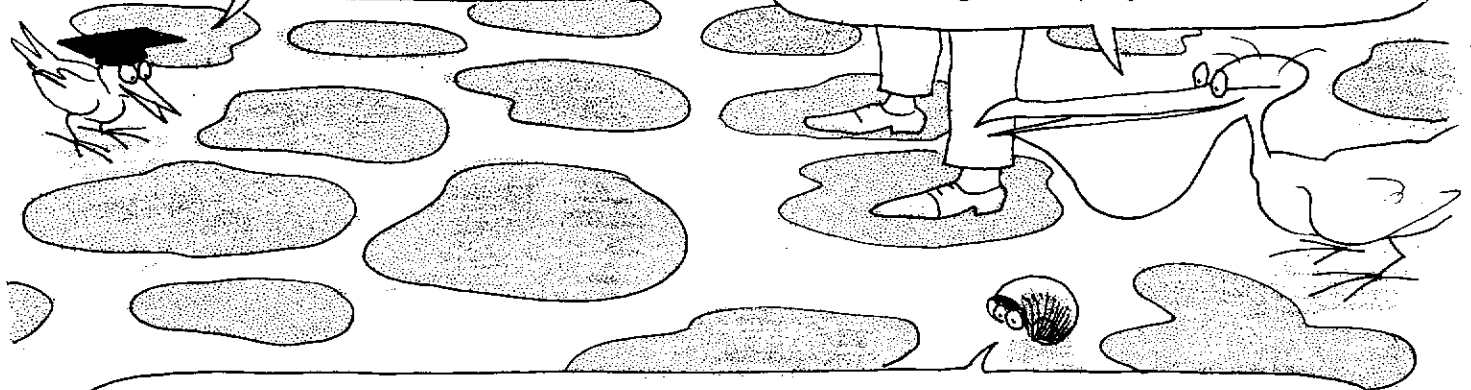
Kandi twarengeje imyaka 700 000 !

MATSIYERI ubu iranyerera ntagitangira ku INDIBA. Wagirango yiyomoyeho...



Kandi si ibyo gusa. Dore matsiyeri yiyegeranya mu bizenga.

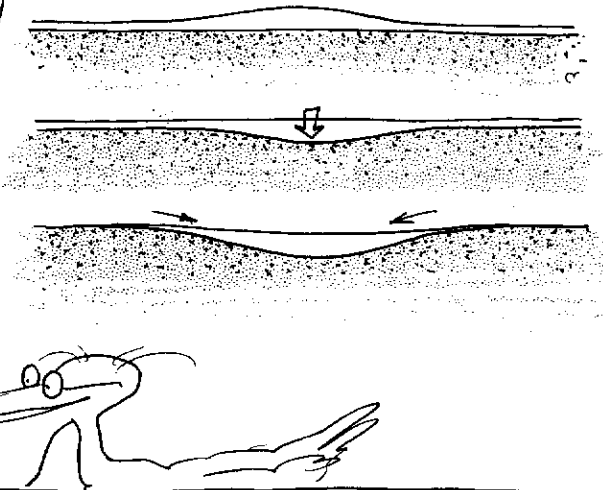
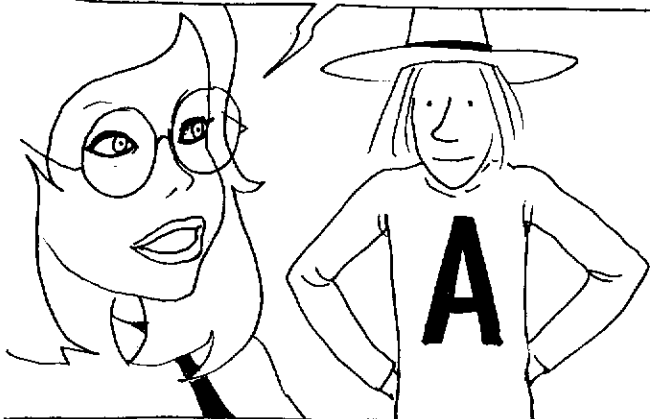
Indiba yoroshye. Irasa n'iyicukura hamwe na hamwe noneho matsiyeri igahita yinjiramwo.



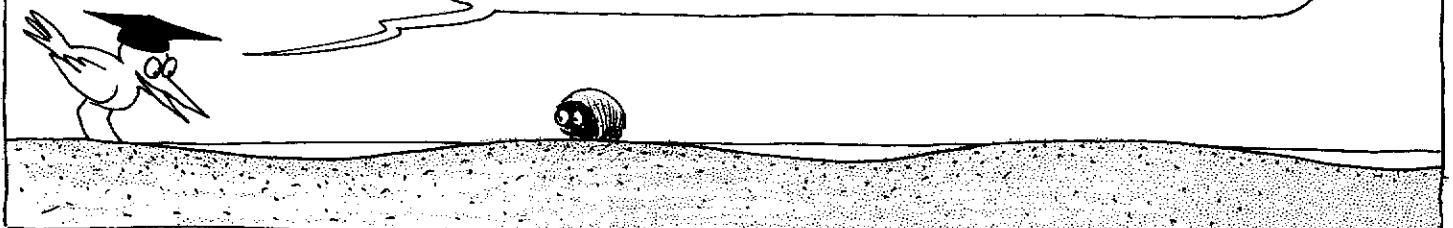
Igitamba-matsiyeri kiraremereye. Kiremerera imfasho yaco, nayo ikika.

IMBURAKICARO NYAGARAVITE

Ni ibisanzwe. Iyo iyegeranya rya matsiyeri rigaragaye, ri**HETAMISHA ESIPASE**. Noneho birtyo matsiyeri nturanyi igakururwa (*).



Birtyo hishyiraho sisiteme y'ibizenga by' **IYEGERANYA RYA MATSIYERI**.



Mu bigaragara, ibinogo
bihavuka ntibiba birebire.

Ibyo byose,
biradendeje.

Urufuro **RURACYAKOMANGATAYE**
cyane k'uburyo ibizenga birebire
bidashobora kuvuka. Yewe n'ibiziba
bya dimensiyo nini bishobora
kuvutsa gusa ubuhetame buto cyane.
Ni ugutegereza ko Iniveri yiyagura
kugirango imfasho ibone
ubunoge buhagiye ...

ISUNIKA RY'UMURASIRE
riracyangana n'ibice bitatu ku
igihumbi by'atimosiferi.

Ibice bitatu ku igihumbi by'atimosiferi !...
ibyo mubyita isunika ry'umurengera ?

IMBARAGA NYAGARAVITE ni nto cyane
k'uburyo iryo sunika rihagiye mu kurwanya
ibikorwa bya yo.

Aha, ni ukuri...
izo mbaraga ni zo nto
cyane kurusha izindi
zose zigenga Iniveri.

Ubu komatanyi bw'urufuro
(isunika ry'umurasire) bubuza
rero imfasho gucukurika kandi na
matsiyeri nayo biyibuza gukomatana.
Ububyimbe bwa Iniveri bugabanya iryo komatana,
iryo sunika. Ariko se bizafata igihe kinga iki ngo
imbaraga za garavite zitsinde ?

Ujyereraniye nk'imyaka miliyaridi 4,5.

Mu gihe uwo mwanya ugitegerejwe, jye nishakira kumenya impamvu ki ibidendezi bifite byose, muri make, diyametero imwe, kandi kuki ari iyo yonyine itaba, hatabaho iyindi..

Ayo megeranya, yerekana iki ?

Kuva kw'icumi kugeza ku bihumbi ijana bw'indemere y'izuba.

UBUREBURE BWA JEANS

Mu busanzwe, kuki hariho ibyo bizenga? Kuki Iniveri idasa kimwe hose ? Nifuzaga kumenya ukuri guhagije kujyanye n'iyi fenomene.

By'ukuri. Ntacyangana n'amageza nyayo.

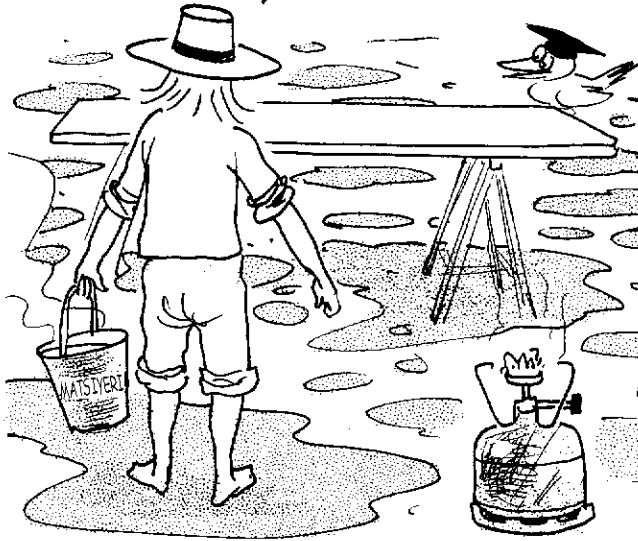
Ubwambere nambere ndashaka kureba uko ikomatanyi rya matsiyeri ryigenza ku mfasho IKOMEYE.

Ifata umwanya wokwirambura, wo kwisandaza.

Imbaraga zitera uko kwisandaza kwa matsiyeri, ni **ISUNIKA**, riyitera gukwiragira mu mwanya uwariwo wose ushoboka.

Mu bigaragara, umwanya ikizenga gikoresha kisandaza, gikuba inshuro ebyiri ubwaguke bwa cyo, ugereranwa na reyo yayo y'ibanze.

Ubwa kabiri, uko matsiyeri iba ishyushye ni nako ikwiragira VUBA.

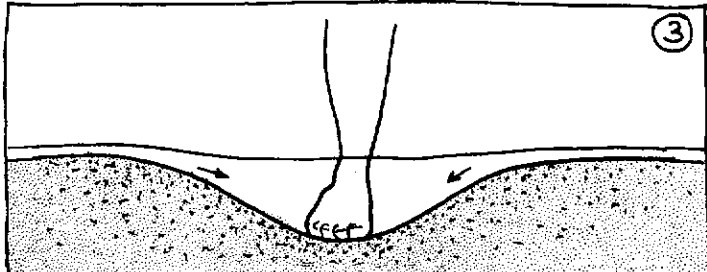
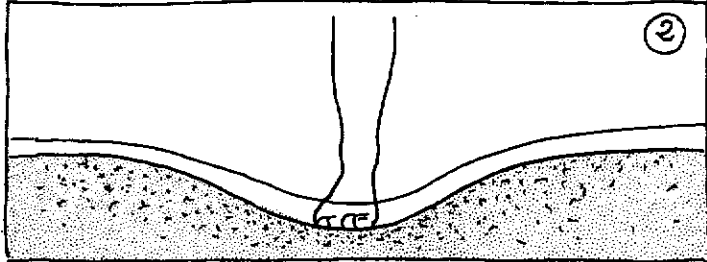
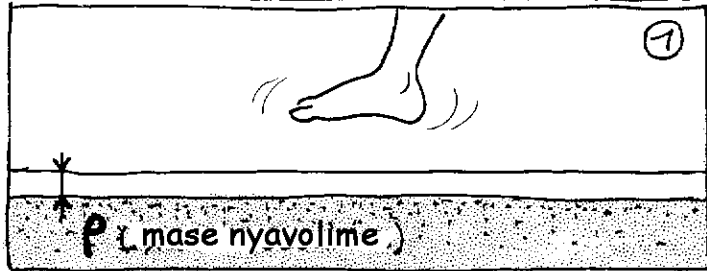


Ni ibisanzwe:
Igipimo cy'ubushyuhe kingana n'isunika: uko aho hantu haba hashyushye ni nako imbaraga zihasangana, imbaraga z'isunika, ziba ari nini.

Mana yanjye... mbega shantsiye!

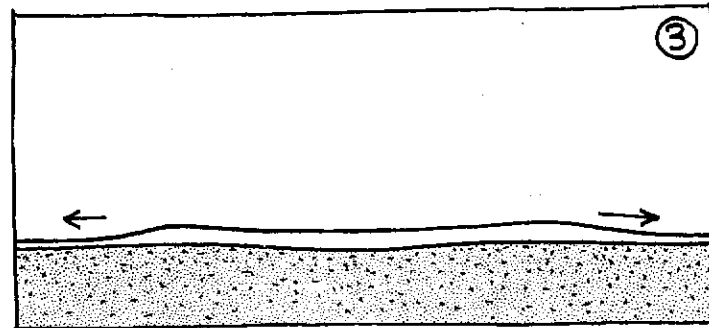
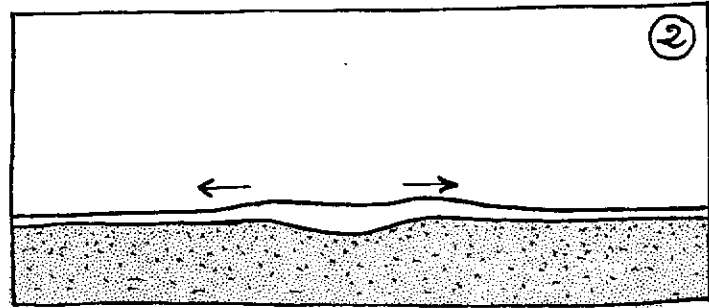
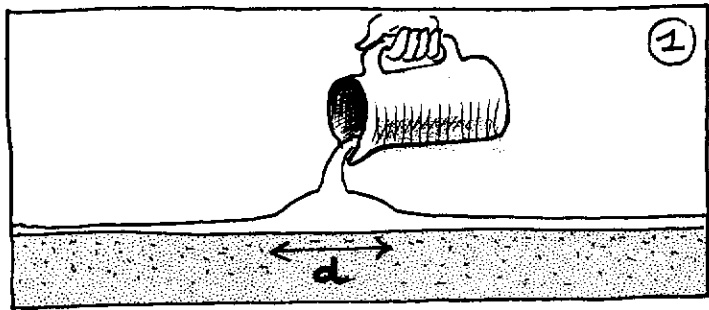


Ubu rero nzi neza uburyo ikizenga cya matsiyeri kigenda gisakaza. Neza, intera ya kabiri: sinshyiraho **INDENGERABUREMERE**, ariko ndongera k'ubushakye ubuhetame bw'imfasho nkweduka.



Icyo cyaho cy'isunika, cyaremwe mu nzira z'ubushake, cyuzura mu gihe cyitwa **UMWANYA WO KWEMEZA**, kiba gito cyane nk'uko ububiyimbe by'igitemba (kigaragaza nka mase nyavolime) buba bunini.

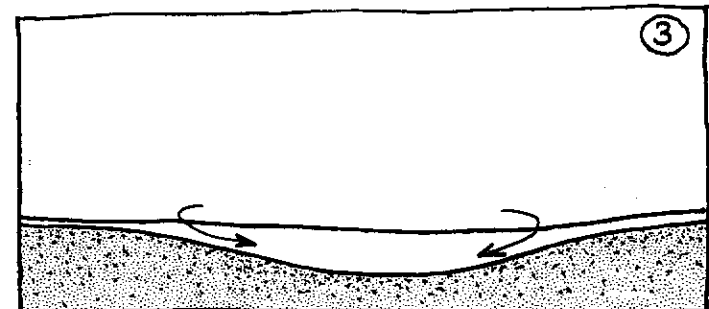
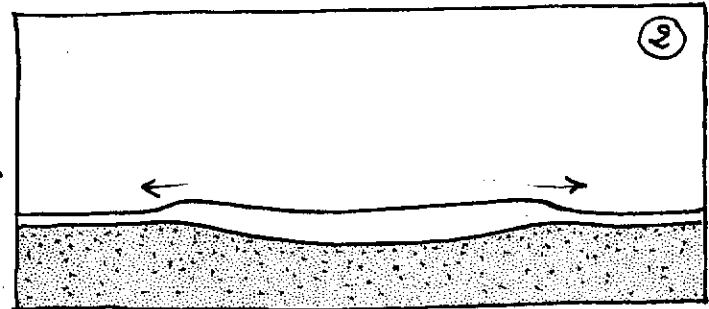
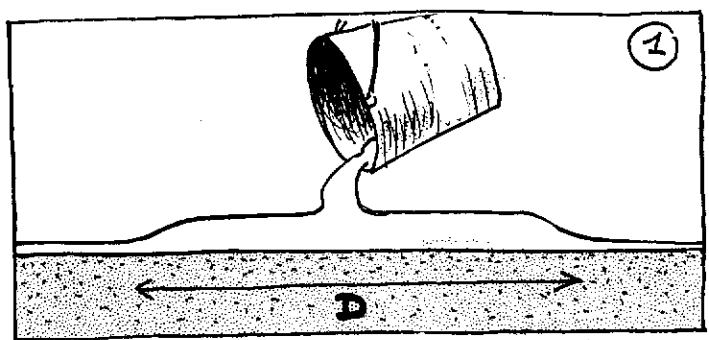
Ubu rero, hasigaye guhuza izo mbaraga ebyiri...



Ihungabana rya dimansiyo nto rizagira umwanya wo gushwiragira muto. Ntabwo rizagira umwanya wo kwaguka kandi ikibaya kizakama vuba kurusha uko cyuzura.



Mu rundi ruhande ihungabana RININI rizagira umwanya wo gushwiragira MUREMURE kurushaho. Kizuzura vuba kurusha uko kizakama kandi kizagira ingeso yo kwaguka.



Kandi ndakeka ko habaho reyo neguzi k'uburyo hejuru ya yo byaguka ?

Urtyo, ni REYO (cyangwa uburebure) bwa JINISI (*).
kandi ibizenga byakozwe byose bifite reyo ijya
kungana n'iyo reyo neguzi.

Byiza, ndabyemeye.
Iyo fenomene y'IBURAKICARO
NYAGARAVITE itera ikatagurika
rya matsiyeri mu bwoko
bw'ibimanyu bizungurutse bifite
reyo iri mu rwego rw'iya Jinisi.
Hanyuma se ?

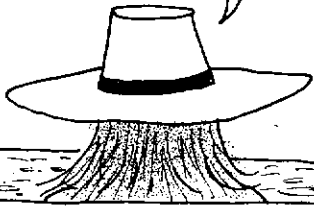
Muri ibyo bimanyu, matsiyeri iba itsindagiye
kandi ishyushye. Igipimo cya yo cy'ubushyuhe
kirazamuka kugera kuri dogere 3000.
Ikigerwaho: matsiyeri iriyoniza hanyuma ikagira
elegitoroni nyinshi zigenga. Ikamatana hagati
ya matsiyeri n'UMURASIRE WO KU NDIBA
rikongera rikigaragaza. Matsiyeri irongera
kandi "ikamata" ku "busa".

Matsiyeri izihatira kujyana n'imfasho,
gaze y'amafotoni, hamwe na yo. Ariko kandi kuberako iyo
ndiba y'umurasire ikibura kandi ubunogyeye, ibyo bibuza ibyo
bimanyu gukomeza umuvuduko wa byo wo kwiyegegeranya.

Mu yandi magambo, Iniveri igiye guturwa n'ibyo
binyagwa, by'igipimo cy'ubushyuhe kiri hafi na hafi
ya dogere 3000, mase yacu ingana n'incuro ibihumbi
cumi cyangwa ibihumbi ijana bya mase y'izuba.

(*) Siri Jemusi JINISI, inzobere muri asitoronomi w'umwongereza. (1877-1946).

Byiza, ubu nta kindi gikomeye kikiza kuba. Isakara rigenda gusa ryigizayo buhoro buhoro mu buryo bwo gutandukanya ibyo bimanyu. Mbere, Iniveri yari imvange y'ama atome ya Idorojene na Eliyomu; none ubu wagirango ni imvange y'ibitemba ikomeza gusakara nyuma y'aho amaso agarukiriza kubona.

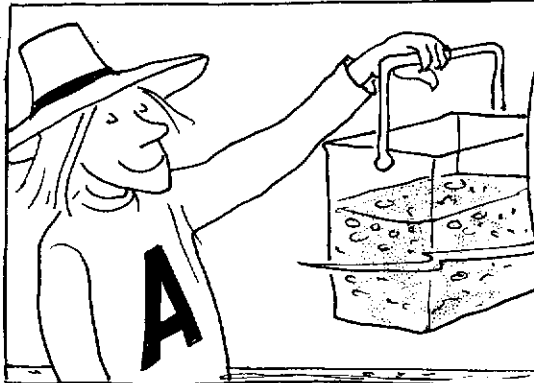
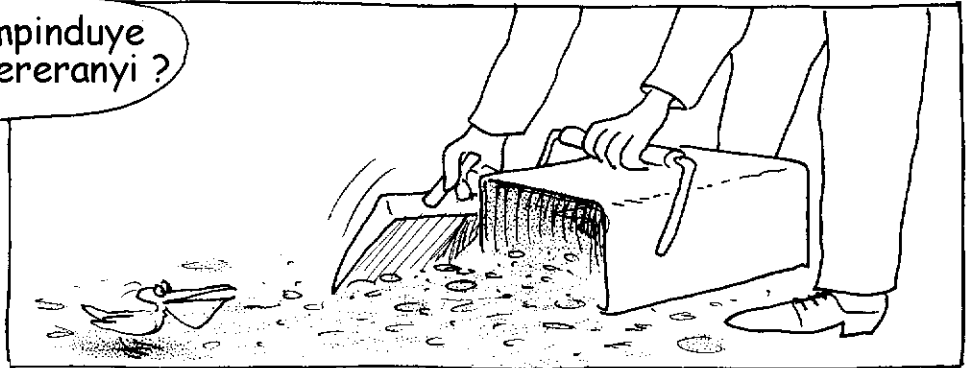
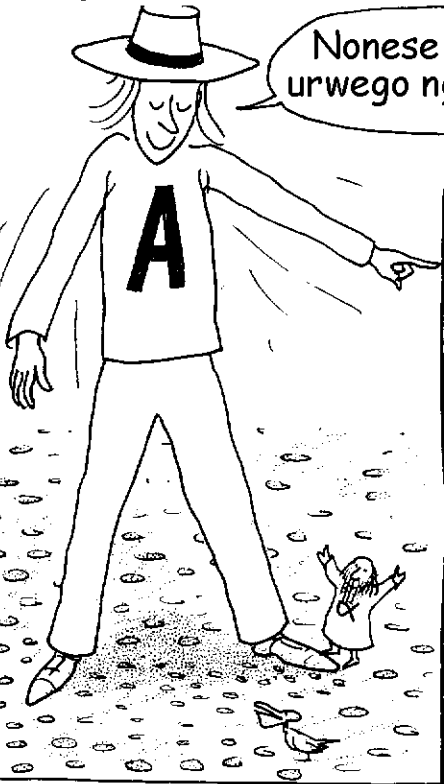


Iniveri ni ikibaya gisakaye hose kinambaye ubusa.



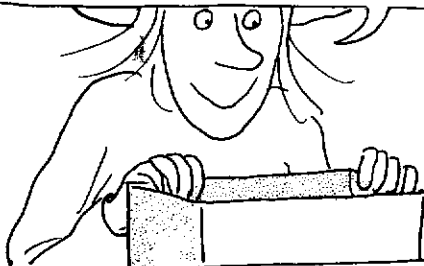
MAKOROKOSIME

Nonese mpinduye urwego ngereranyi ?



Kuri urwo rwego, matsiyeri ni iyo mvange y'ibitemba by'ibimanyu.

Ngiye kuyisuka ku mfasho ikomeye, noneho ndebe igihe bifata kugirango bisanzare. Hanyuma nzabisubiramwo ku mfasho yoroheje...



Mu yindi mvugo, subiremwo, ku rwego rugari, ayo mageza yo mu gihe gishize.



aho hantu hashya naho hafite igipimo cy'ubushyuhe cya ho, gishobora kumenyekana, muri icyo mvange y'ibitemba, ukoresheje umuvuduko w'itingisa w'ibyo bimanyu (*).

Mu yandi magambo, ufite iyindi ntumbero iganisha kw'imanyagurika ku rwego ruhanitse cyane.

Kandi ngu ko uko za **GALAGISI** zikorwa. Si byiza se ?

Twongere kandi inshuro imwe yindi duhindure urwego.

Biroroshye, icyo gitemba, gifatwa nk'imvange ya za galagisi, kizatugeza ku yindi fenomene nshya yo **GUCIKAGURIKA** ku rwego rundi ruhanitse cyane.

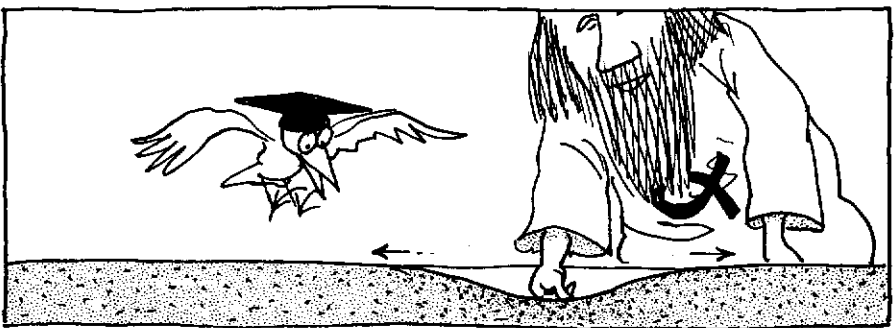
Iryo cikamwo uduce ritanga **AMATSINDA Y'AMA GALAGISI**.

(*) **IGIPIMO CY'UBUSHYUHE** ni igipimo cy'ingufu-rugendo rwo hagati na hagati rw'uduhimba tw'aho hantu nsukuma-ntemba.

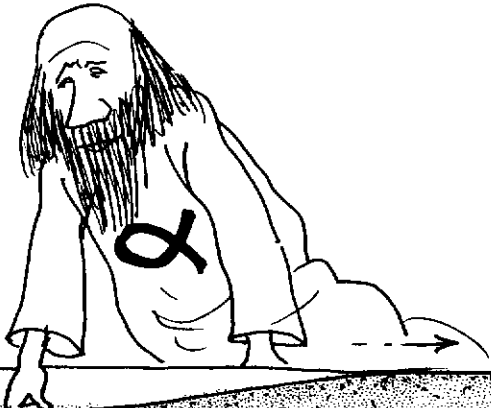


Iniveri ni ikicaro cya fenomene y'**ICIKAGURIKA RY'INKURIKIRANE.**

Ndatekereza ko ibi bikomeza mu buryo bw'iburaherezo.



... ubwo buhinduraforoma, ubwo **BUHETAME** bw'imfasho, buzatangira gusakara iruhande hose k'umuvuduko wa km 300 000 /s.

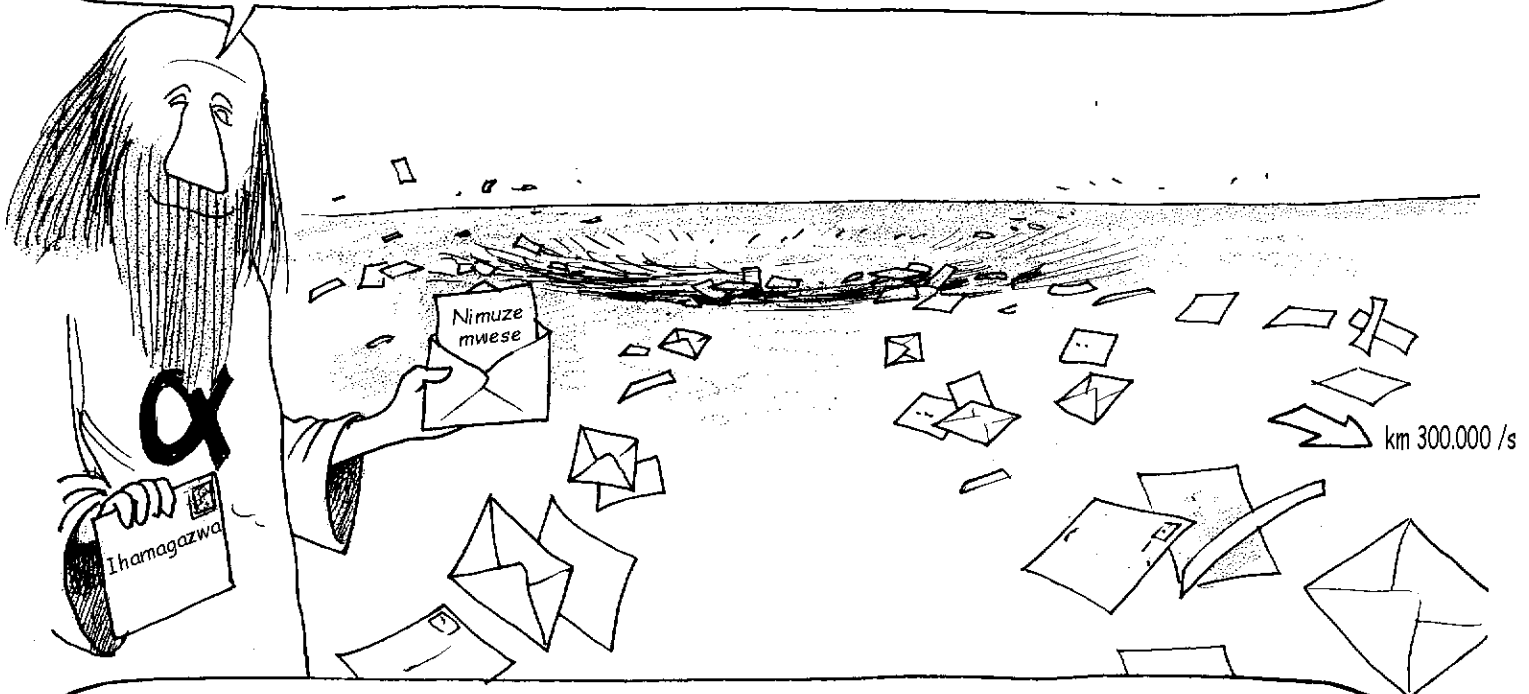


Ariko rero, igisakara,
ni ... urumuri ?

Oya, ni onde y'ubuhetame,
onde nyagaravite.

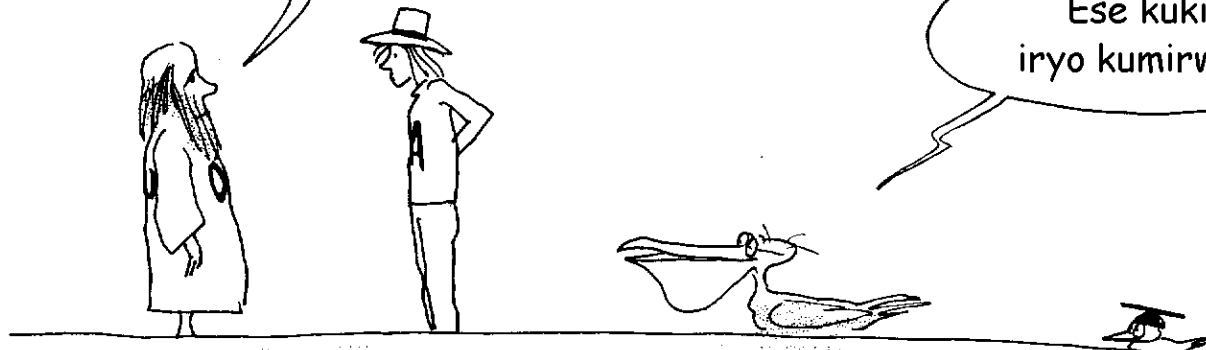
UMURIMA NYAGARAVITE
urasakara k'umuvuduko ungana n'uw'urumuri.

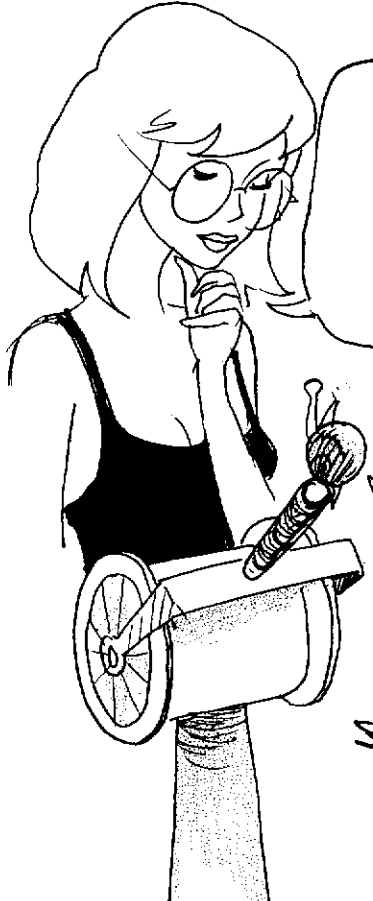
Mu buryo bumwe n'iryo sakara ry'ubuhetame, iyegeranya
rya matsiyeri "ritumira" matsiyeri nturanyi kuyegera.



Iyo fenomene y'ihungabana nyagaravite ibaye, mu karere runaka
ka esipase ya diyametero D , izaba ntagushidikanya nto kuri Ct ,
aha C ari umuvuduko w'urumuri naho t ari
imyaka y'uburambe bwa Iniveri.

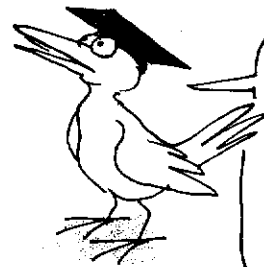
Ese kuki
iryo kumirwa?






Jyewe ndabyumva. Tuvugeko ushaka guhamagaza, ukoresheje amabaruwa, abantu mu mana izaba mu minsi 4. Uzashobora gusa gutumira abatuye k'ubutaka by'ubufaransa. Naho, hirya ya ho, ntibizashoboka kubera igihe.

Ni byo pe! ntabwo byashoboka ko watumiza abantu mu nama mu gihe gito kurusha umwanya w'ubusakare bw'amabaruwa y'ubutumire.



KORONOTORONI yerekana imyaka miliyoni ijana. **RERO** imiterere isakaye cyane ishobora kubaho muri kino gihe igomba kuba ifite diyametero iri munsu ya miliyoni ijana z'imwaka-rumuri. Ni cyo kiduhagarikira ku **MATSINDA YA ZA GALAGISI**.



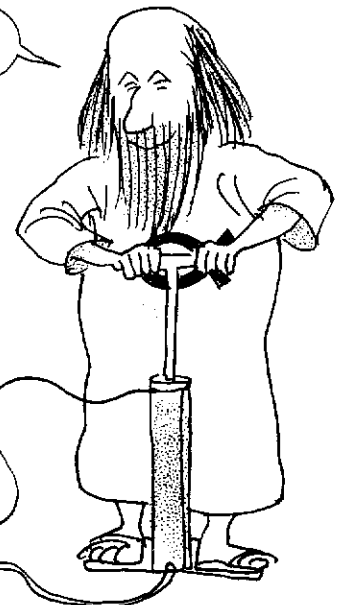
Abazagira ukwihangana ngo bategereze imyaka miliyaridi icumi bazashobora kubona hirema **IMIGOGO Y'AMATSINDA** (amatsinda y'amatsinda y'amagalagisi).

Ariko Iniveri iri mu **BWAGUKE**. Muri rusange, irakweduca ariko urebeye aho uri iriyegeranya...

Mugiye kwirebera...



Ntabwo izi icyo ishaka!

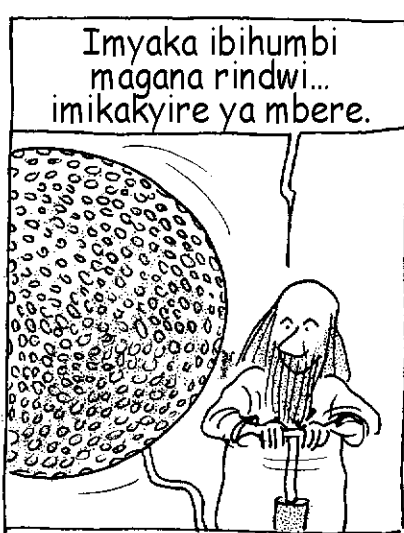




Imyaka ibihumbi ijana,
Iniveri ishyushye kandi
isennye bubobere nk'igi.



Ndahaga
gato...



Imyaka ibihumbi
magana rindwi...
imikakyire ya mbere.



Igipimo cy'ubushyuhe..

**IMBANZIRIZA
MATSINDA
NYABUNYENYERI
zirirema.**

Mu nsi ya dogere 3 000



Imyaka miliyoni ijana

Birakatse
ubwa kabiri



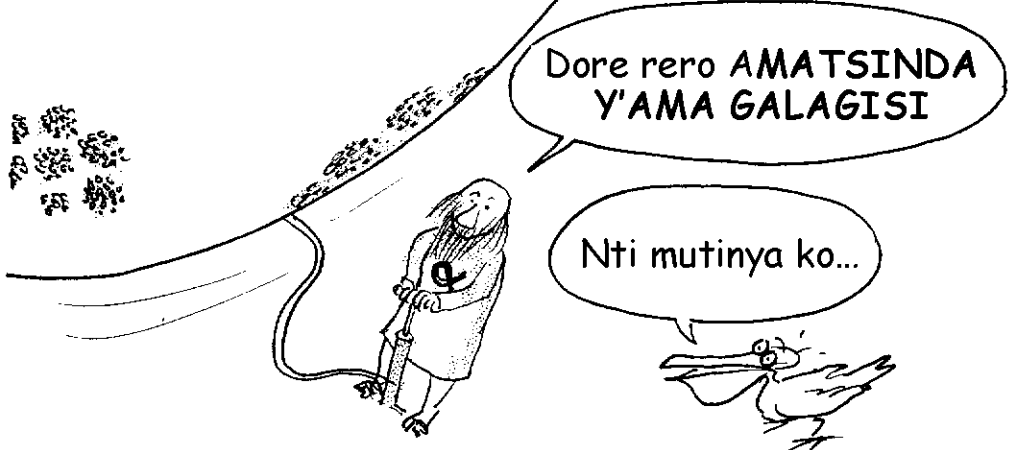
Ni za
GALAGISI

Komez a uhage.
Biteye amatsiko.



Ehee, Iniveri yongeye gukaka

Nk'aho
yangaga kugara



**Dore rero AMATSINDA
Y'AMA GALAGISI**

Nti mutinya ko...





AMATSINDA YA ZA GALAGISI
Amazeza ariho arakome

Tugeze kuri t=imyaka miliyoni 500. Galagisi zamaze rero kuremwa, naho zikigizwe n'ibibumbe by'imyuka ishyushye ku gipimo cya dogere 3000, imbanziriza matsinda z'inyenyeri. Zegeranirijwe mu myanya y'imburasunika: amatsinda y'amagalagisi. Aho ngaho, zijya kwitwara nka za molekile za gase kandi zihora mu njyendo nzererezi.

Iniveri iracyitsindagiye, kandi za galagisi zizinjiranamwo, zihure n'ingaruka z'AMAHONDANO.

INGARUKA Z'AMAHONDANO

Reba, ziriya galagisi ebyiri, cyangwa ahubwo **IMBANZIRIZA-GALAGISI** zigiye gutsetana.

Ikintu kimeze nk'icyambu kirirema hagati ya zo

Ikiraro kiracitse

Ayo mahuriro atangiza ingendo **NYINZENGURUKAHO** mu ma **GALAGISI**.

Ikintu nk'icyo cyabaho no muri gaze.

Amahame amwe niyo ajyenga ibikorwa, haba ku rwego rw'imburaherezo nini cyangwa se ku rwego rw'imburaherezo nto. **AMAHONDANO** ashyira za **GALAGISI-MOLEKILE** mu **NYINZENGURUKAHO**. Ingufu za buri galagisi zigenda rero zikwirakwiza mu migabane ingana mu **NGUFU NYANYEREZI** ($1/2 mv^2$) no mu **NGUFU NYINZENGURUKAHO**. Ibyo bihe nganyamugabane by'ingufu, cyangwa se **BY'IRINGANIRA NYABUSHYUHENGENDO**, ni byo buri gitamba gitumbera kigana mu buryo karemano (*)

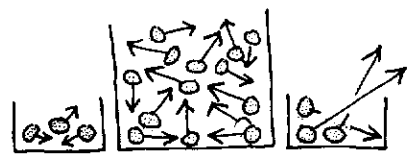
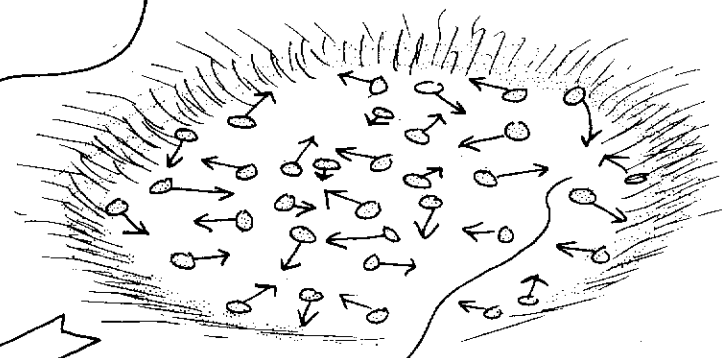
Ese, mu yandi magambo, ni ayo mahuriro ya za galagisi **AREMA** urugendo nyinzengurukaho rwa zo ?

Mu ntangiro gusa. Ama galagisi akibwiruka ahura n'amahondano ya buri gihe. Ariko vuba cyane, **ISAKARE NYAKOSIMOSI** riyigizayo noneho ya mahuriro akazaba mbarwa.

Mu yandi magambo, urugendo nyinzengurukaho tubona muri ino minsi ni ikibutso cy'igihe Iniveri, **IKIREMEREYE CYANE**, yarigize **ITSINDA NYAHONDANO**.

(*) Ihame rya kabiri rya terimodinamikye

Utungo dufite **IMIVUDUKO Y'ITINGISA** yegerereye umubare-gaciro wo hagati na hagati. Ariko itomboza ry'amahondano rirema, rimwe na rimwe, utungo tubangutse cyane n'utungo tugenda buhoro cyane.



IMIVUDUKO MITO **IMIVUDUKO YO HAGATI NA HAGATI** **IMIVUDUKO YIHUTA**

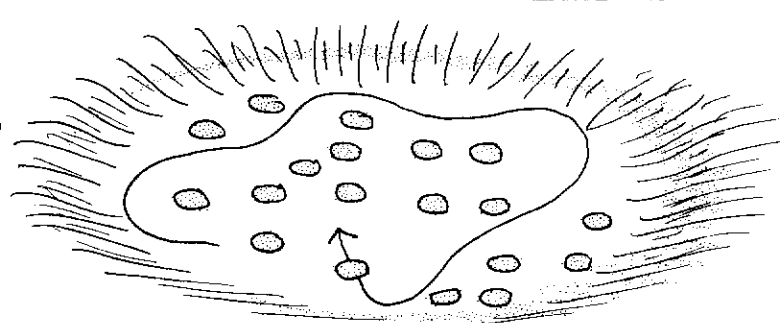
CAHO!

Utungo twagize umuvuduko wihuta cyane, dushobora gusohoka mu kibaya kandi tukava no mw'itsinda. Ibyo bizagerwaho igihe umuvuduko wa byo uzaruta **UMUVUDUKO MBOHORA MW'ITSINDA.**



Nk'uko bwirema buri gihe, biturutse ku mahondano akurikirana, ubwo bwoko bw'utungo twihuta cyane, **ISISITEME** nk'iyi **NYIREMERAGARAVITE** izagira umuco mvukano wo gutakaza urebye vuba na vuba, utungo twa yo (*)

Utungo twinshi cyane tuzashimishwa no gukora urujya n'uruza muri icyo kibaya.



Hakurikije incurikaburyo, iryo tomboza mu mahondano rizarema
UTUGINGO TUGENDA BUHORO CYANE, tuzagira ingeso yo "kugwa"
hagati y'iyo **SISITEME NYIREMERA GARAVITE HONDANIRO** kandi
tunahabyiganire. Hagati y'**AMATSINDA HONDANIRO** (aho habera
amahuriro hagati y'utugingo) hazagira rero ingeso yo kwakira utugingo
tugenda **TUREMERA** kurushaho.

Urugero, reba ibiba
hagati ya ririya **TSINDA
RY'AMA GALAGISI**.
Ama galagisi agenda **BUHORO**
zirahiyegeraniriza kugirango
zibyare **GALAGISI
NDYANYI!**

Imfasho itangire
gutoboka mwogacwa mwe...

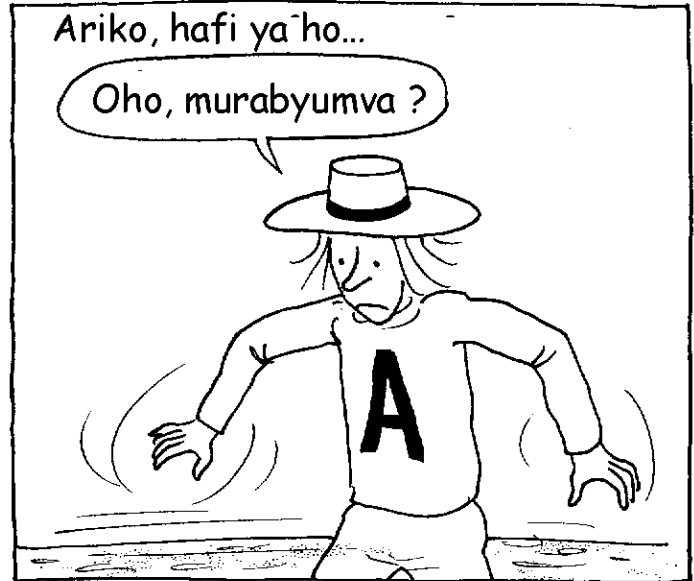
Mbega wee,
wagirango imfasho iraganjwe !...

IMANGA NYABUKARA

Magisi, ntabara, biRASHWANYUTSE!

Gashahurwe!
Tireziyasi
ihangane
rwose!

KRAAAK



Icyo ni iki?
Umutingito w'isi?

Imfasho icibwamwo
n'imirari izamuye, nkaho yaba
ari za onde z'ihetama!

Hagomba kuba
harabaye **IGWANAMWO**
NYAHOMBANYA
ahantu hamwe...

Ibyo NI onde z'ihetama arizo bita,
muyandi magambo, **ONDE NYAGARAVITE.**

Bisa n'ibitangiye gutuza

Birasa naho habuze gato ngo mugenzi wacu atwarwe n'**IMANGA NYABUKARA**.

Dore Magisi na Tirezinyasi bagarutse

Nyabuneka, imfasho ya palanete-Iniveri si intaganzwa. Iyo uyitsikamiye cyane irika, iraneshwa...

Mbega imanga !
Nta nubona **INDIBA** yayo...

ni ibisanzwe,
na za fotoni ntizishobora kuhasohoka...

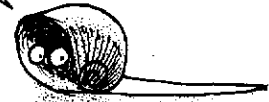
Sinzashobora kuhasohoka nabusa. Ndiho ndamara **IMBARAGA ZANJYE ZOSE**.

Ni iryo **SHWANYUKA** ryaremye ayo ma **ONDE NYAGARAVITE**, mu mwanya ushize...

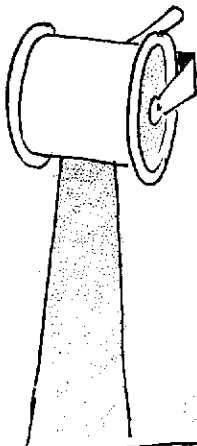
Imburagasani yihinduka

Nti wegere !

Mu gusoza, ntabwo iyi Iniveri isaba gusa gushwanyuka.
Ahubwo, icy'akarusho ni uko mu bijyanye no kuva ari iyambere!



IGICANIRO GIKURU CY'URUGWIRO



KORONOTORONI irerekana ko miliyaridi z'imyaka zamaze guhita. Iniveri yaracagaguritse. **AMA HONDANA** yashyize za **GALAGISI** muri **NYINZENGURUKAHO**.



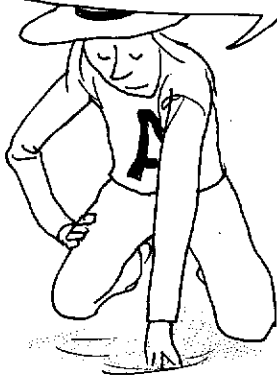
ISAKARO ryigijeyo ibyo bintu byose bimwe kure y'ibindi, k'uburyo ubu bitakimenyana na gato.

Muri ayo "**MBANZIRIZAGALAGISI**" ikintu k'ibanze gihora ari ubwo bwinshi-nyegeranyi bwa za atome iyonize, **IMBANZIRIZA-TSINDA NYABUNYENYERI**, ry'igipimo cy'ubushyuhe cyegeraye dogere 3 000, kandi idashobora gushwanyuka kubera iryo matana n'**INDIBA Y'UMURASIRE**

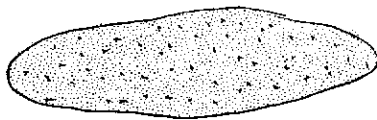
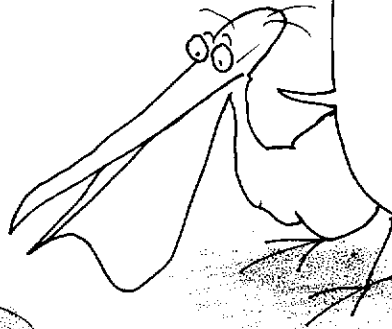
Umuntu wari kuba arangamiye Iniveri icyo gihe yari kubona ibipfumu byijimye, birekura urumuri rucye...



Imfasho yaje kunanuka cyane.
Isakare rya Iniveri ryagabaniye bihagiye
ISUNIKA RY'UMURASIRE.

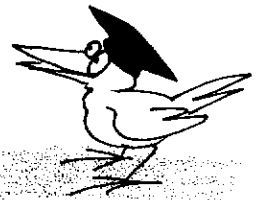


Ese **IYEGERANYA** rya
MATSIYERI rishobora gute
kuzasubira kuba undi muni? iyo
ibimanyu byiyegeraniye, igipimo
cy'ubushyuhe bwa byo kizazamuka
ubwacyo kugera hejuru ya dogere
3000, birtyo rero imatana ku
NDIBA ntizahagarara na rimwe,
kandi iyo ndiba izajyanwa buri gihe
muri urwo rugendo rw'iyegeranya,
si byo ?

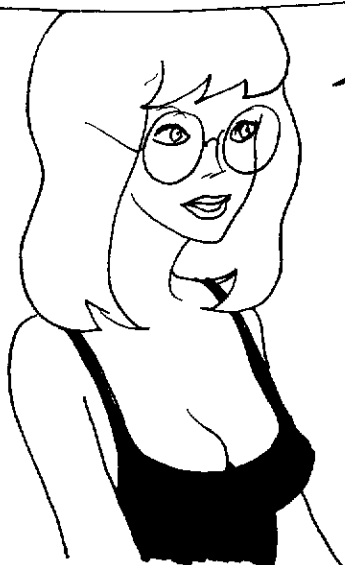
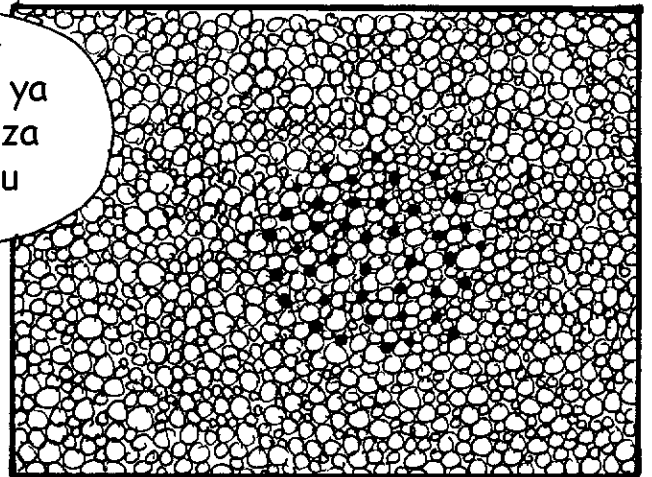


IMBANZIRIZA MATSINDA NYABUNYENYERI

Ni byo pe, Lewo, ariko ubu ingufu
nyagaravite, mu mbanziriza matsinda zigiye
"gukomatanya **UBUSA**", bugizwe n'amafotoni
y'imbaraga nkye cyane.



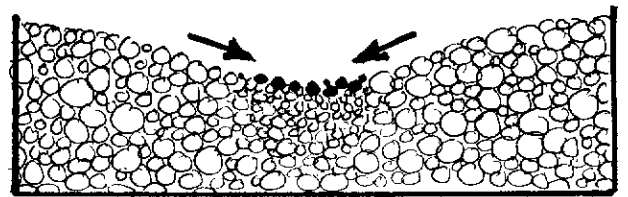
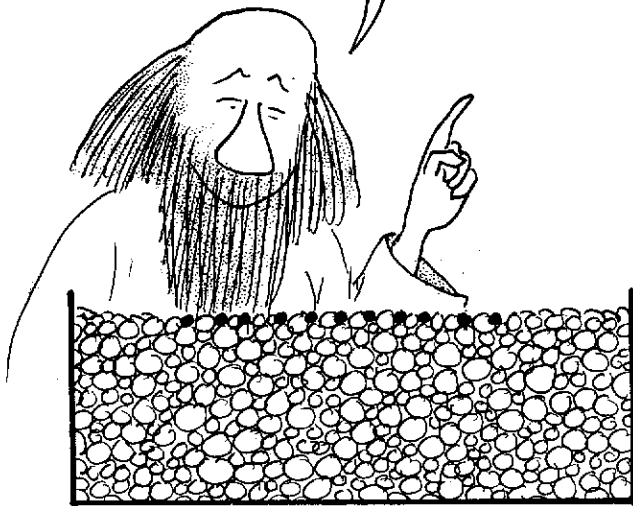
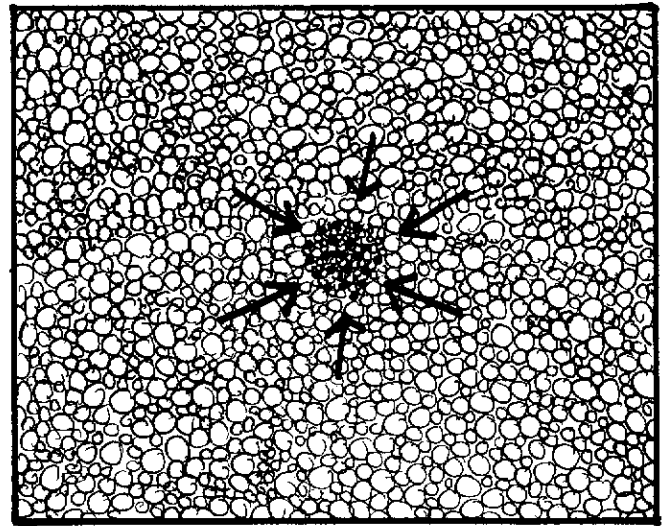
Ahantu ikimanyu kiri, iyo **MBANZIRIZA-**
TSINDA NYABUNYENYERI, isa n'imvange ya
MATSIYERI, n'iy' "**UBUSA**", ni ukuvuga ya za
fotoni z'ibanze, byose hamwe bikaba biri ku
igipimo cy'ubushyuhe bwa dogere **3000**.



Nonese iyo bikomatanye?



Matsiyeri ntizanyerera kuri esipase, indiba y'urumuri nyakosimosi, ariko ahubwo izayijyana hamwe na yo, nk'uku g'uku.



Buretse, ibi bizaba rwose neza igihe isunika ry'isakara y'umurasire rizaba ryamanutse kugera mu nsi y'umubare umwe neguriro. Niba ntibeshye, ibyo nibiba, bizabera rimwe hose muri Iniveri.

Bizaba FIYATI LUXI (*).
Dore, akira izi ndorerwamu.
Ntibizongera gutinda...

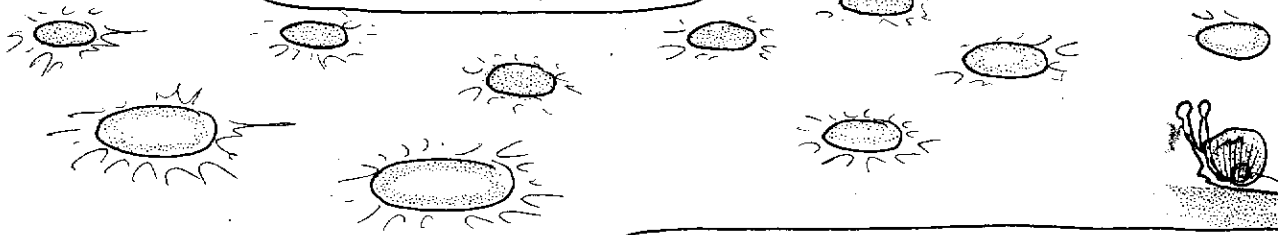
Ndemeza ko nishimye bihagije kubera iyi gajeti ituma hatangwa ikimenyetso cyo gutangirira icyarimwe kugenda muri Iniveri yose.

Bikomeye cyane.
Ahubwo rero, biratangiye.

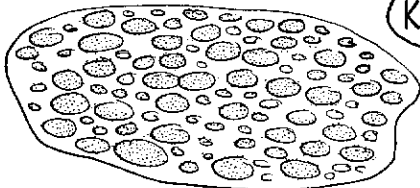


IMBANZIRIZA MATSINDA ZIRIYEGERANYA.

Igipimo cy'ubushyuhe cya zo kirazamuka. Ama atome yohereza imbaraga nyinshi azinyujije mu ndengera-viyole kandi zigahita ziciraho.

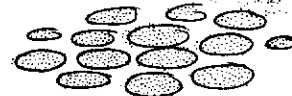
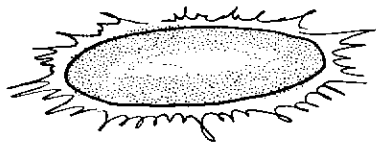
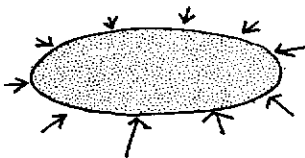
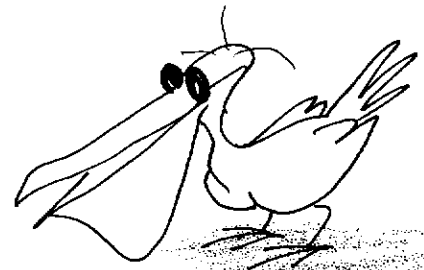
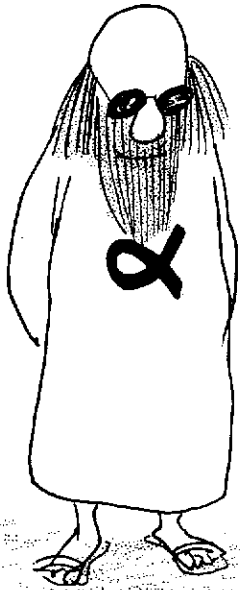


Dore, **IMBANZIRIZA MATSINDA NYABUNYENYERI** ziciyemwo ibice.



Kubera iki !?

Bitewe n'ingufu nyagaravite, matsiyeri igaragaza imyitwarire kamere yo **KWICAGAGURA** mudu "selile" dufite reyo ingana na **REYO YA JINISI**. Iyi nayo yaguka nk'uko igipimo cy'ubushyuhe kizamuka. Iyo habaye igabanuka ryihuse ry'icyo gipimo cy'ubushyuhe, reyo ya jinisi iragabanuka kandi ikaba nto kuri reyo y'icyo kintu. icyo gihe haba icagagurika ry'ako kanya.



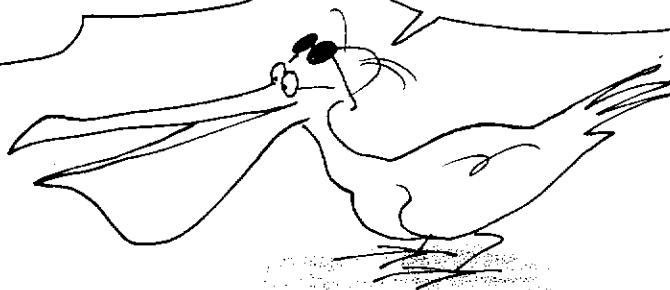
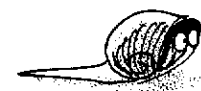
Ikimanyu kiriyegeranya kandi kigashyuha.

Iroherezako kanya umurasire NV

Ibyo biragikonjesha hanyuma kikicagagura.

Turirebera rero ifenomene yo
GUCIKAGURIKA Y'URUKURIKIRANE
RUPANZWE, ariko mu
yindi nzira.

Ariko se byo
bizahagararira he ?



IKAMATANA

Icyoroshye cyane ni ugukora
amageza. Muri iyi silenderi,
ngiye gukomatanya matsiyeri.
Tuzareba neza...

Byose byagaragaye

BAWUMU

Habaye iki ?

IKAMATANA, nshuti ya njye, ikamatana.
Iyo ukomatanyije idorojene, nuwayo zayo
zirakamatana hanyuma zigatanga imbaraga.
Iyaba wari wambajije, na byo...

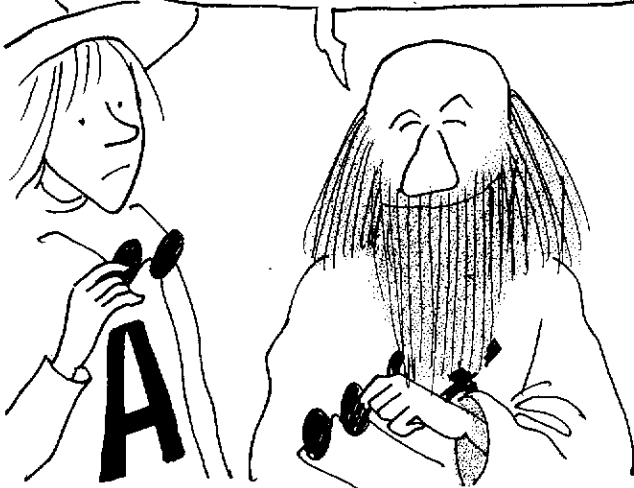
Reba, biraciragura n'umujinya cyane

Inyenyeri
ziriya ki je

Bizamara igihe kinini ?

Kuri ako karindi k'umuriro, abasore bacu Babura idorojene, ariko ibyo ntibyatinda kugaruka mu buryo.

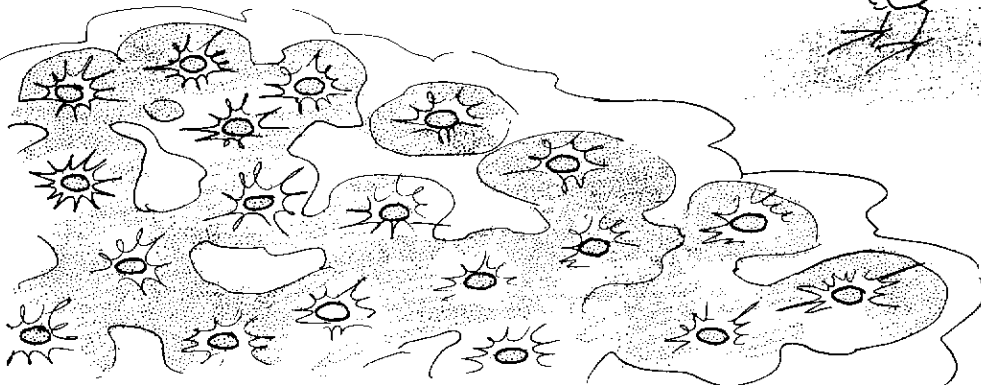
Mumpaye ikizere !



Matsiyeri yose yihinduyemwo inyenyeri ?

Oya si nk'uko rwose. Iyo inyenyeri ivutse, yohereza umurazire ahariho hose, kandi ikarekura na matsiyeri. Birtyo rero, irashyushya (rero igahagarika hamwe) matsiyeri ihagereye cyangwa igashwanyaguza ibyariho byirema mu buryo buruhanije hirya no hino aho.

Mu yandi magambo, kuri iyo ntera, **GALAGISI** ni imvange y'inyenyeri zaka cyane na **GAZE NSIGARIRA**.



iNyenyeri zisakaza ingufu kandi zigashyushya gaze.
Birtyo zongera **ISUNIKA** rya yo...

AMAGALAGISI



Noneho izo **MBARAGA NSUNIKA** zikwedura icyo kirere cy'icyuka.

GAZE



GALAGISI Y'INYENYERI

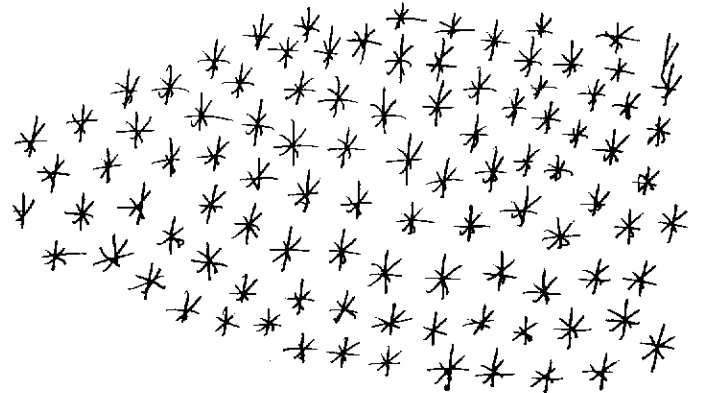
Uwo "**MWUKA NYAGALAGISI**"
urenga cyane umupaka wa
"**GALAGISI Y'INYENYERI**"



GAZE NSIGARIRA



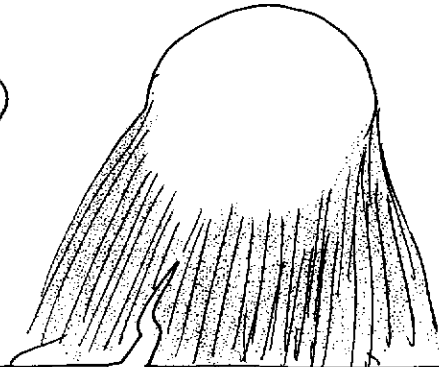
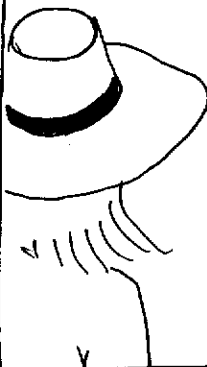
Iyo galagisi iremereye
cyane (miliyaridi
igihumbi z'inyenyeri)
isa niyatakaje gaze
yayo yose. Kubera iki ?



Ni ukuri ! **GAZE NSIGARIRA**
ya yo yagiye he ?



Yenda ntayarihari...



Byatuje ubu. Ariko igihe miliyaridi
igihumbi by'inyenyeri z'iyi galagisi
zacaniraga icyarimwe, byari
ITANURE nyaryo.

Biryo **UMUVUDUKO W'ITINGISA NYABUSHYUHE (*)**
wageze ku majana menshi y'ibirometero kw'isegonda, umubare usumbye
UMUVUDUKO W'IBOHORA. Ama atome yose ya gaze nsigarira
yavuye rero muri icyo kibaya kinini aricyo iyo galagisi.

Mu bundi buryo, **IMBARAGA NSUNIKA**
zajugunye gaze nyuma y'icyo kibaya.

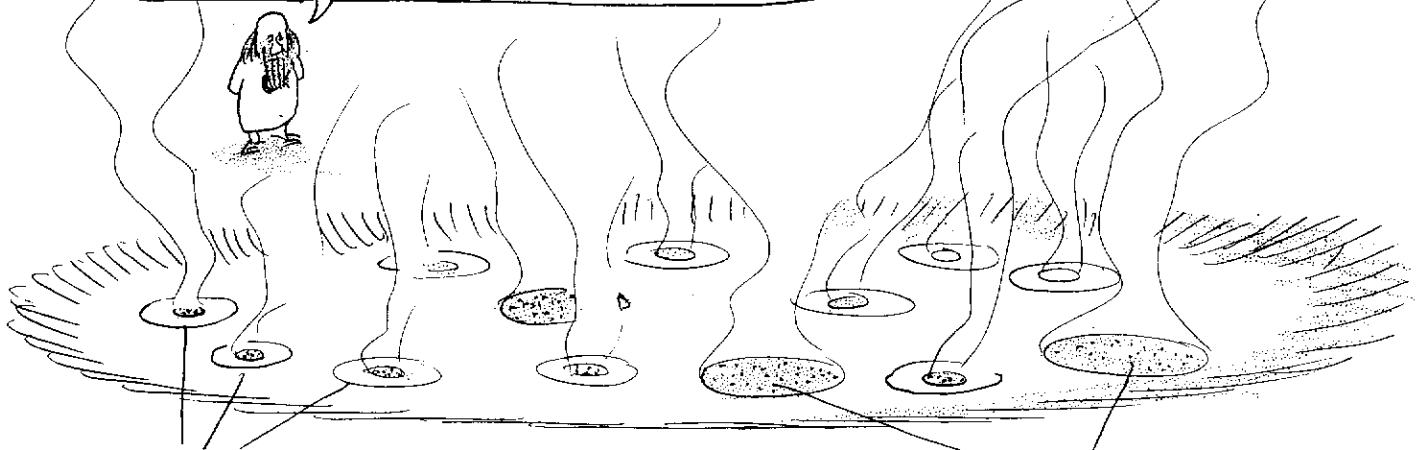
Ndatekereza ko umunsi umwe iyo gaze
izongera ikagwa muri icyo kibaya ?

Utumanyu twa gaze nsigarira,
muri icyo gihe, twahawe umuvuduko
w'umurengera kandi twageze kure cyane.
Ntituzagaruka na rimwe. Ikindi kandi,
mu gukweduka, iyo gaze yabaye
nyamukye cyane.

Iki gishatse kuvuga ko
ama atome atongera guhura
na gato kandi ko azagumana...
... umuvuduko wa yo
igihe cyose.



Ikoraniro ry'amagalagisi ry'ITSINDA rizarambarara rero muri uwo murima wasakaye, w'igipimo cy'ubushyuhe cyageze ku mamiliyoni y'ama dogere, ariko wabuze cyane, urekurwa n'ama galagisi aremereye.



GALAGISI ZITAREMEREYE

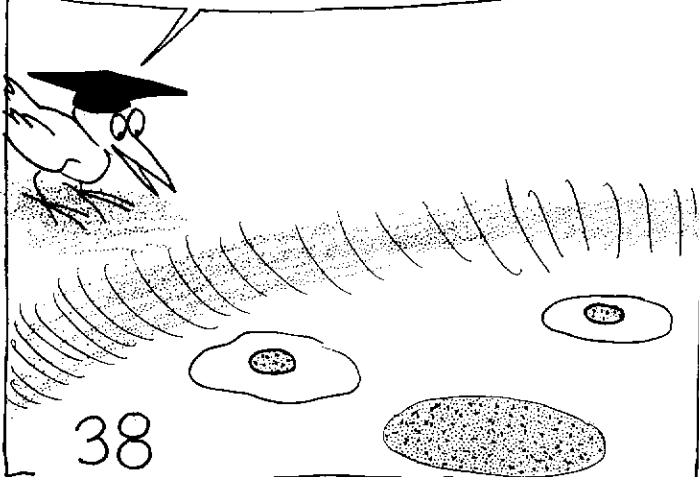
GALAGISI ZIREMEREYE

Galagisi zitaremereye ni nk'ama tanure adacana cyane. Azabika gaze ya yo.

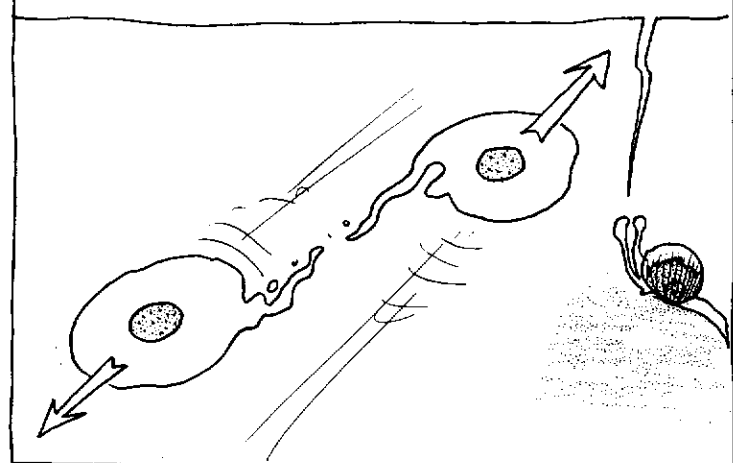


Agenda ahinduka mu mburasunika-tsinda nk'amagi mw'ipanu ishyushye.

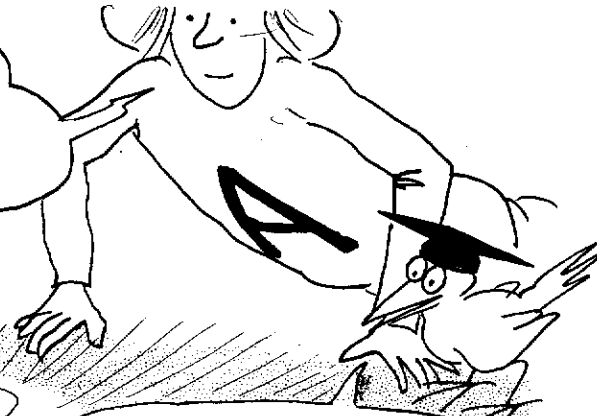
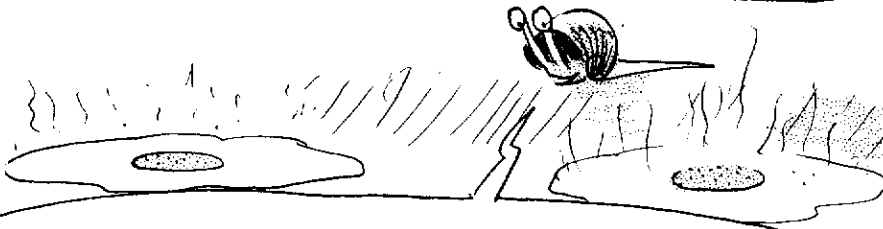
Ama galagisi ataremereye agira "umweru" n' "umuhondo", ariko rero za galagisi ziremereye, bita ELIBUTIKYE, zifite gusa umuhondo munini.



Ibibumbe bya gaze nsigara z'ama galagisi ataremereye byongera amahirwe ya byo yo kwinjirana mwo. Urugendo nyizengurukaho rw'ibyo bibumbe bya gaze ruriyongera.



Inyenyeri zaratuje mu bw'itonzi.
Iruhande y'icyo zari ziri zikivuka,
zahindutse nk'amakara asanzwe.



Iyo ziba zarakomeje ziryo
ntizari kumara igihe kinini.

Gaze nsigarira
y'ama galagisi ataremereye
atanga urumuri.

Urwo rumuri ruva he?



Ama atome.
Ese reba.



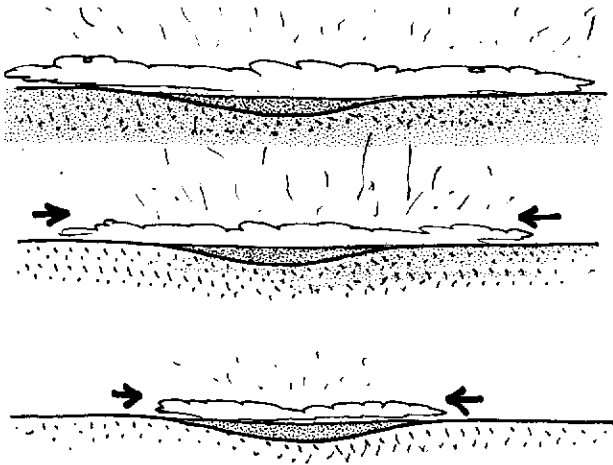
Ama atome abiri
atangiye gusekurana...

... ibyo biherekezwa n'isakazwa
ry'urumuri. Muri icyo gikorwa, igice
kimwe cy'ingufu-rugendo y'ama atome
gihindurwa mu ngufu nsakazwa.

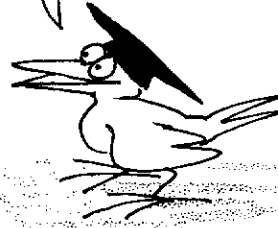
Umuveduko nyatingisa
bushyuhe w'ama atome uragabanuka.
Iyo mase nyamwotsi **IRAKONJA**
kandi uvuze **IGIIMO BUSHYUHE**
aba avuze **ISUNIKA**.



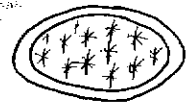
GUKONJA NYAMURASIRE BYA GAZE



Uko ingufu nsunika zigabanuka, gaze nsigarira, **MPUZANYENYERI**, izajya gusubira mu mwanya wayo, muri "galagisi nsakibaya", mu mutuzo.



"umwera" wigaranzuye "umuhondo"



U MUDELI werekanywe aha ni ironдора rya **DIMANSIYO 2** (dimansiyo ya gatatu ikaba ikoresheya mu kwerekana ubuhetame, umurima nyagaravite, n'ibindi n'ibindi...). Ama **GALAGISI** ni ibintu nya dimansiyo eshatu. Ama Galagisi atazenguruka, cyangwa azenguruka buhoro cyane, azagira iforomu ijya gusa na **SIFERI**. Ama Galagisi yizengurukaho n'ingoga azabyatarara nka capati. Iyacu, **UMUYOBORO NYAMATA**, wizengurukaho rimwe mu myaka imiliyoni 200.

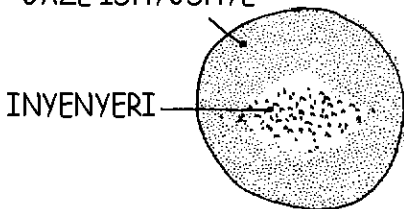
Igihe gaze nsigarira iguye noneho kuri galagisi ya yo, ingufu nzengurutse zibuza iyegeranywa mu nzira nkurikirareyo. Ibiramambo, nta kizarwanya iyegeranyo rikurikiye umurongo nyizengurukaho. Gaze mpuzanyenyeri, mu ma galagisi, izagira iforomu ya **DISIKYE IBYATARAYE CYANE**:

UBUYOBOZI

GAZE ISHYUSHYE

GAZE IKONJE

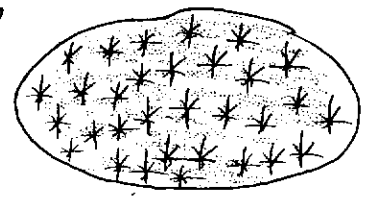
INYENYERI



Nimba nabyumvise neza, muri Iniveri, hari, ubirebye neza, ubwoko bubiri bw'amagalagisi:

- Amagalagisi aremereye, nyankwadura serikyeri, atagira mu by'ukuri gaze
- Amagalagisi ataremereye, afite inyenyeri ziri hagati ya miliyaridi icumi n'ijana, ayo agaragara nk'**IMVANGE** y'amagaze abiri: **GAZE Y'INYENYERI** na **GAZE MPUZANYENYERI**.

I **SUPU NYABUNYENYERI** irimwo rwose inyenyeri nyinshi ku buryo zagereranywa na za **MOLEKILE ZA "GAZE NYABUNYENYERI"**



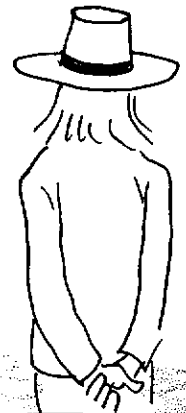
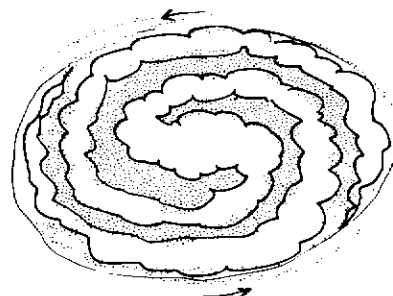
IMITERERE NZENGURUKYE

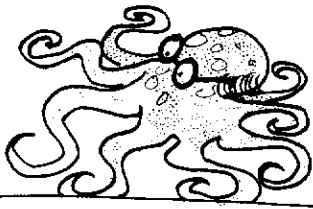
Reba, hari ikintu cyihariye rwose kiriho kiraba: ama gaze mpuzanyenyeri na "gaze nyabunyenyeri" ntabwo zizenguruka ku muvuduko umwe. byiryo rero umwanya mpuzanyenyeri wabaye **NYAMVANGE**.

Gaze nsigarira yizengurutsa vuba kurushyaho.



Irirambura nk'umukwege w'iforuma ya nyamwizengurukaho





Ndi ... umu asitorofiziye

Ndebera, uriya muntu ni nde ?



Nonese iyo mishumi yose,
ni iyo gukora iki ?

Kugirango nshobore
gusobanukirwa neza fenomene
zose ziba mu magalagisi

Tukiri kumwe nawe, watubwira
impamvu nyamukuru y'**IMITERERE
NYAMWIZENGURUKAHO
Y'AMA GALAGISI**

Ahaa, inzobere !

**IMTERERE
NYAMWIZENGURU-
KAHO !?**

Nyabyo

Yararigise! ...

Aferi
y'amayobera ...

FULUPE !

Igisubizo nkusanyanji jo

Mwasobanukiwe n'ibyo yavuze ?

Yego, jyewe nifuzaga kubisobanukirwa neza

Yavuze FULUPE !

Ndemeza rwose ko nashoboye kugira igitekerezo kuri byo

Ubwambere ndagondagonda indiba y'ipanu nk'uku nguku...

Wafungiyeye iki kintu kw'isahane ya garamafone. Kubera iki ?

Ugiye kubona icyo uzabona !

Ntubyumva...

Nduzuzza isahane n'igitemba hanyuma byose mbyinjize mu rugendo nyizengurukaho.

Dore!

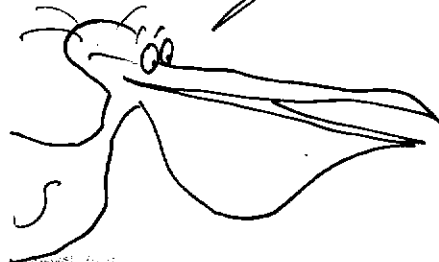
Ipanu isimbura umwanya nyabunyenyeri, naho ikawa isimbure gaze mpuzanyenyeri nsigarira. Iyo mpararitse isahane, ikawa izenguruka VUBA KURUSHA ipanu kandi hazavuka za ONDES NYAMWIZENGURUKAHO.

IMITERERE NYAMWIZENGURUKAHO
y'amagalagisi afite gaze nsigarira yaba yaraturutse rero kuri fenomene y'ITSIRIMANA NGENDANYI, amatsinda abiri y'ibitemba : **GAZE MPUZANYENYERI** na "**GAZE NYABUNYENYERI**", zizenguruka ku mivuduko inyuranye, "IREREMBA" umwe ku wundi, nk'uko igitemba kireremba ku indiba y'ipanu...

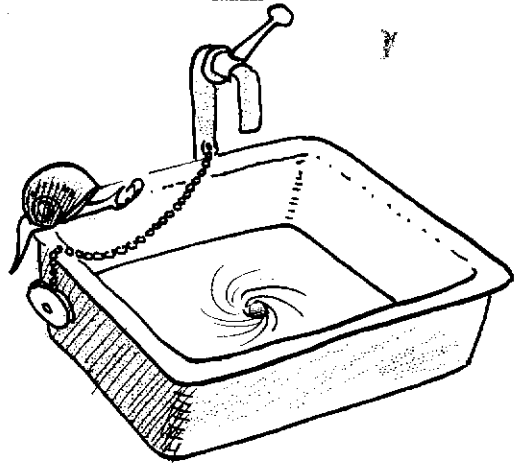
... nk'uko ikawa ireremba hejuru y'indiba y'igikombe.

Ariko, ni kuki amagalagisi
NYASERIKERENKWEDUYE
zitagira imiterere ya
nyizengurukaho?

Kuberako gusa zitagira
GAZE NSIGARIRA. Zarayitakaje
igihe cy'icanwa ry'**INYENYERI**
MBANZIRIZA zazo.

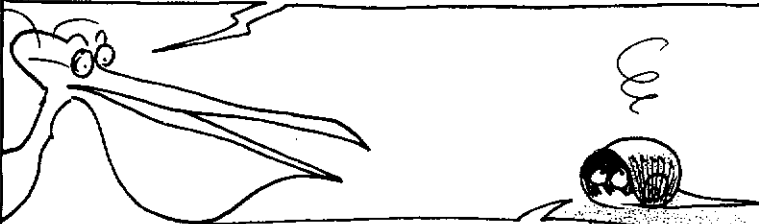


Ni kandi fenomene
y'ITSIRIMANA NGENDANYI ikora
imiterere nyizengurukaho igihe
cy'ividurura ry'akavugutiro.

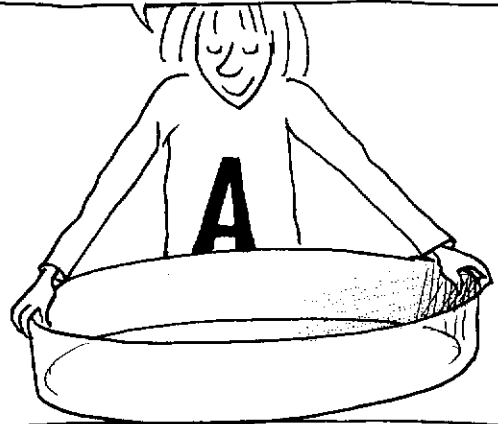


Ngaho mbwira, uziko ibyo uvuga birakomeye.
Birtyo rero urufunguzo-nsobanuro rwa
amayobera y'amagalagisi nyizengurukaho
rwaba ruba mu ndiba y'ibikombe by'ikawa,
cyangwa by'utuvugutiro?!?

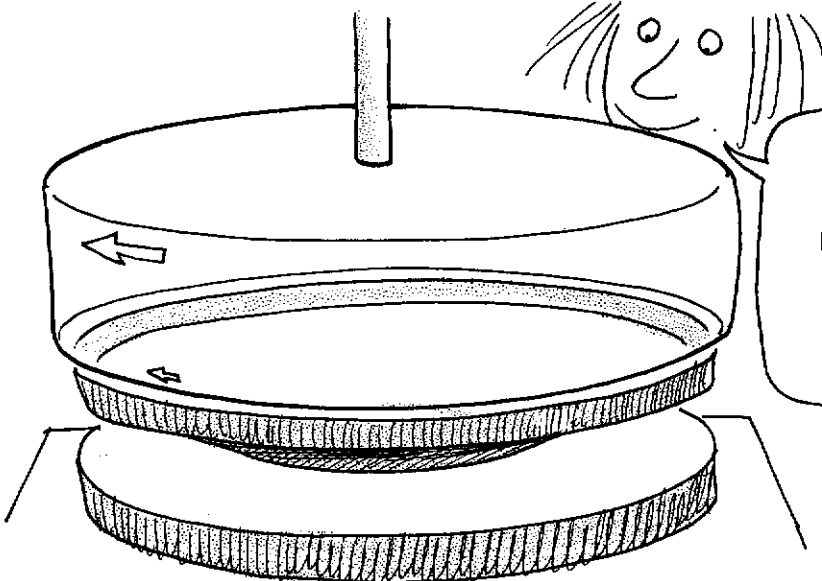
Hariya, twahuzaga igitemba
n'urukuta rukakaye. Tugerageze
na sisiteme aho mase ebyiri
z'ibitemba zijombana ibikorwa.




Amagalagisi yaba ari imwenge
y'ividura rya kosimosi?



Nafungiranye gaze mu nsi y'iyi
nzogera kandi nashyize ikinyabuzi
mw'ipanu. Mbikesheje iyi sisiteme,
nshobora kwiga ibiba igihe mase
nyagaze ijombana ibikorwa
n'iyindi mase nyagitamba.

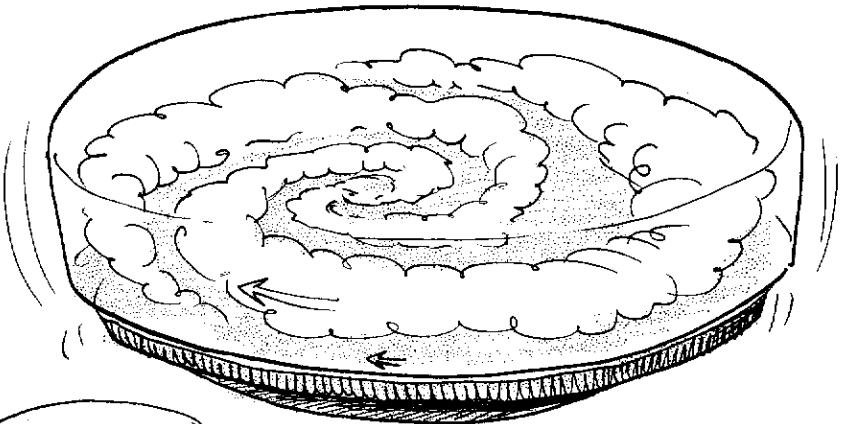


Iryo tsirimana ibinyamazi-gaze ugereraniye ni ntagatege. Uzarema amahinduka nyamwanya y'igipimo cy'ubushyuhe n'iki isunika, byoroheje cyane : amajanja macye atarenga aho...


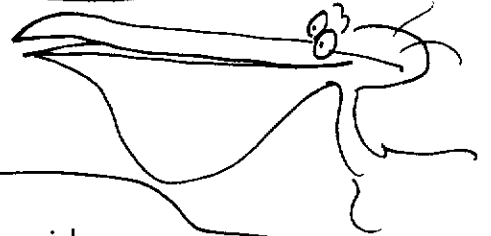


Ariko gaze yanjye yashyuhijwe birenze n'imyuka y'amazi. Isaba gusa **KWIYEGERANYA** iyo habaye ihinduka na rito ry'igipimo cy'ubushyuhe (*)

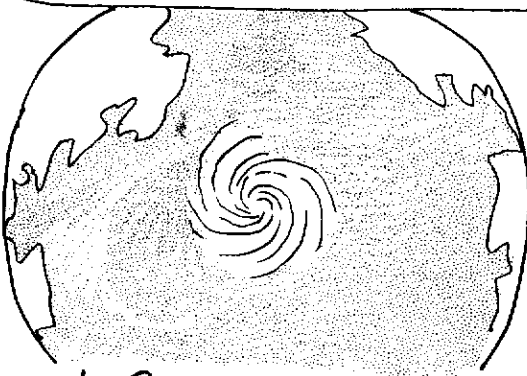
Reba ! Anselimi yakoze igitangaza cya **SERWAKIRA NKORANO**.



Nziza cyane !



Ndabivuze, Magisi, ufite ukuri ! Muri serwakira, mase y'umwuka wuzuye ububobere "irareremba" ku mfasho yayo itemba, ibyo bitera impinduka z'**ISUNIKA**, z'**IGIPIMO CY'UBUSHYUHE**, **ZITANGIZA** iyegeranya ry'umyotsi y'amazi. Kandi iyo fenomene ya **KABIRI** igaragaza mu buryo bw'imvururu ya cyane fenomene nyamwizengurukaho **MBANZIRIZA** (**)



Byiza, ariko ni irihe sano n'amagalagisi ; imiterere nyamwizengurukaho ntabwo rwose ari igicu cy'umwotsi w'amazi ?

46 (*) umwotsi **NDENGERANEGUZI**

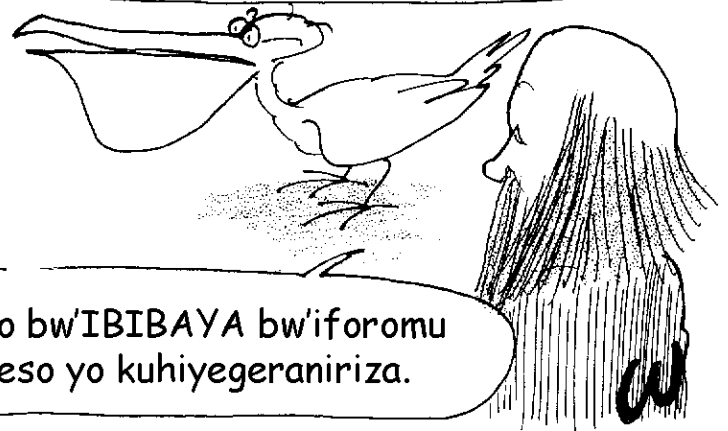
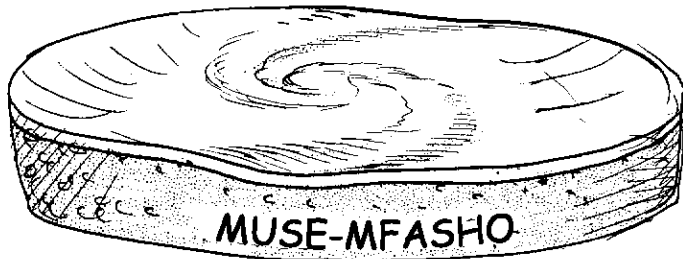
(**) fenomene irekura kandi ubushyuhe ikanagaburira serwakira ingufu (ariko ibyo ni iyindi nkuru).



Tugaruke ku **UMUDELI WACU** wa galagisi. Mase nyagitemba igaragaza "**GAZE Y'INYENYERI**" izenguruka mu "**KIBAYA**" cyacyo. Irengewe na mase ya **GAZE NSIGARIRA** izenguruka k'umuvuduko wihuta kurushaho. Bikurikirwa na fenomene y'**ITSIRIMANA NGENDANYI** kandi noneho igabura-nsakazi rya **MASE** rirahinduka, impinduka ikaba ifite ya gewometiri **NZEGURUKWAHO**.

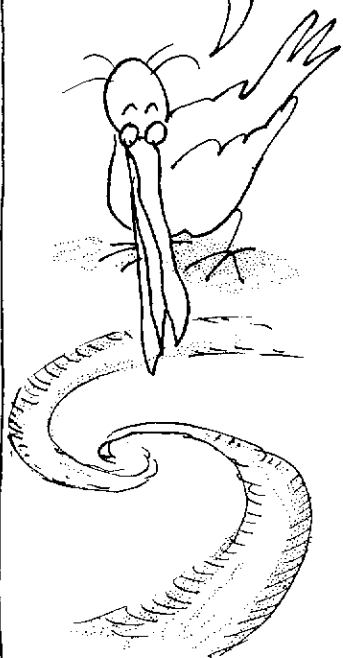


Nyegeranyi yose ya **MATSIYERI** (inyenyeri cyangwa gaze) icukura ako kanya iyo muse-mfasho. Ahari **MASE**, haba hari **UBUHETAME**.



Mu yandi magambo, hazaboneka ubwoko bw'**IBIBAYA** bw'iforomu nyizengurukahaho, aho gaze izagira ingeso yo kuhiyegeraniriza.

Ariko simbona n'ubu na rimwe iyegeranya ry'umwotsi w'amazi.



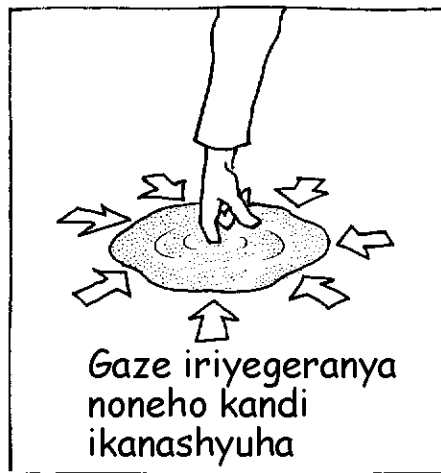
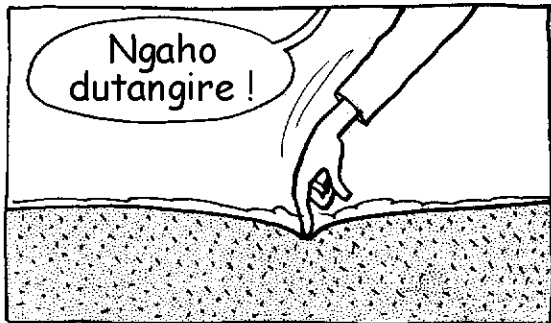
Tuyore gaze mpagatiranyenyeri nkye



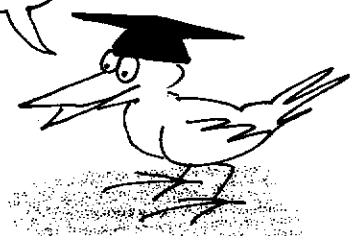
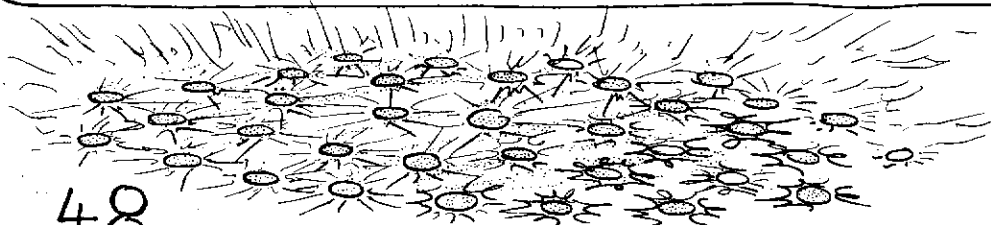
Turebe ikiba kuri gaze mpagatiranyenyeri iyo "iguye" muri ubwo bwoko bw'ibibaya...



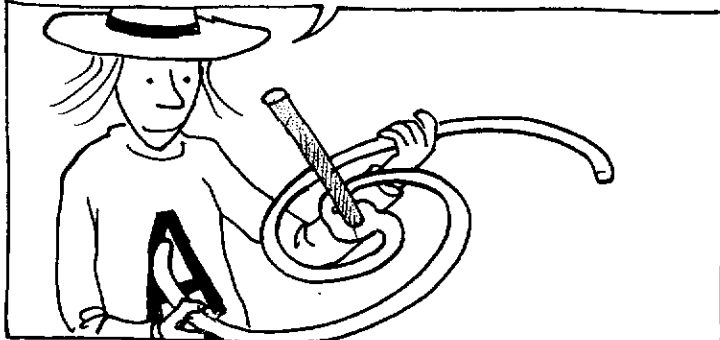
IHINGURO-NTUNGABUZIMA NYAGALAGISI



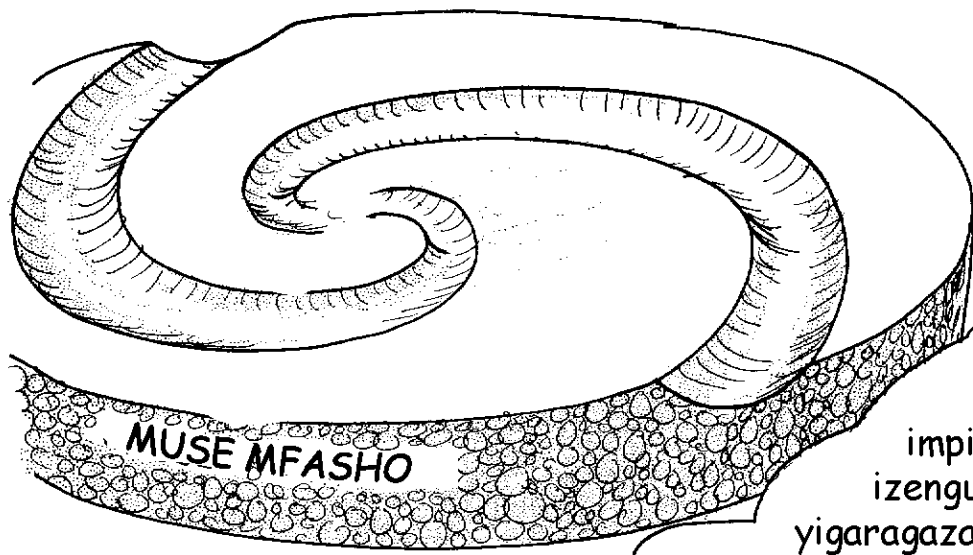
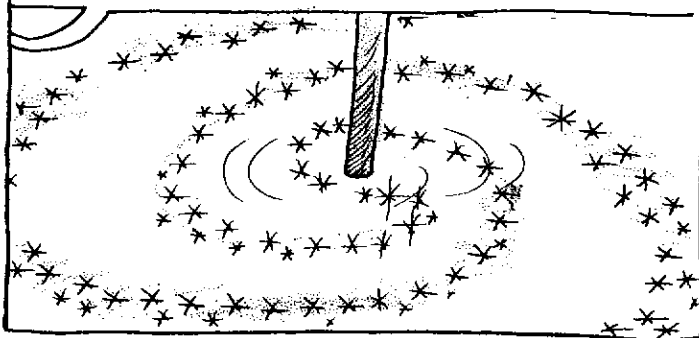
...twaka tubyara **INYENYERI Z'IKICIRO CYA KABIRI.**



Nifashishiye ubu bwoko bw'agacamurongo ngiye ubuho kurema i KIBAYA.

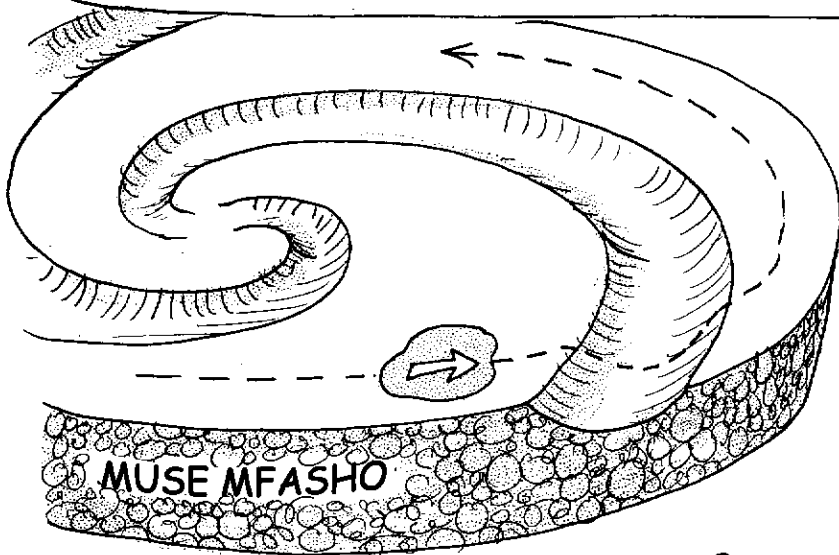


Ni kimwe: inyenyeri zivukira muri ibyo binogo, muri icyo kibaya.



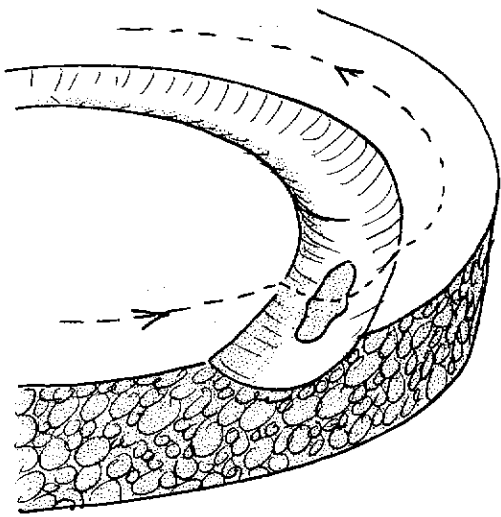
Anselimi afite ukuri :
impinduka nyakwizengurukaho,
izenguruka, yo, buhoro cyane,
yigaragaza ikoresheje buriya bwoko
bw'ibibaya ugereraniye bito cyane

(utujanisha duke tw'ikinogo rusange ki "ikibaya-galagisi")



Gaze mbumbatiranyenyeri
izenguruka vuba kurusha
impinduka nyanzengurukaho.
Aha ngaha turabona igice cya
gaze cyitegura kwinjira muri
buriya bwoko bw' "ikibaya"

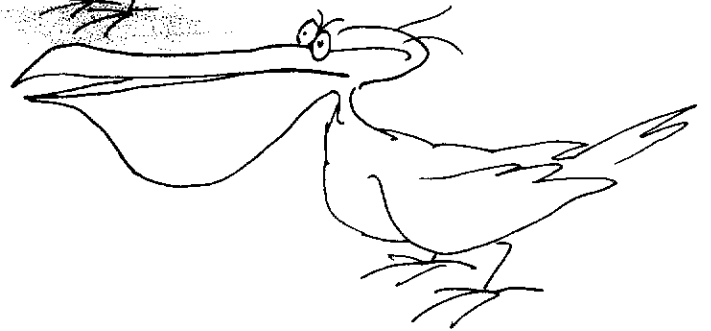




Iyo kigeze mu ndiba ya kiriya kibaya irakomatanywa noneho ikabyara, hagati aho, **INYENYERI** nke **ZO MU KICIRO CYA KABIRI**. Hanyuma kikisohokera buhoro buhoro nta nkomanzi. Ayo **MABOKO NYIZENGURUKAHO** rero ni ububyariro bw'inyenyeri nshya.



Humu...

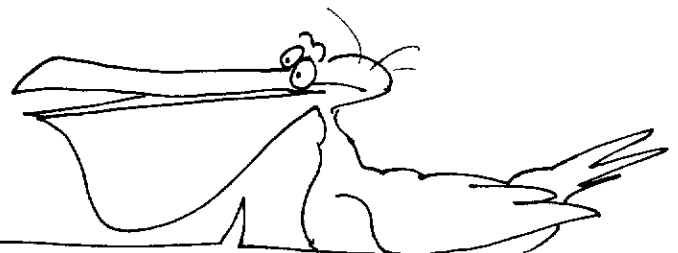


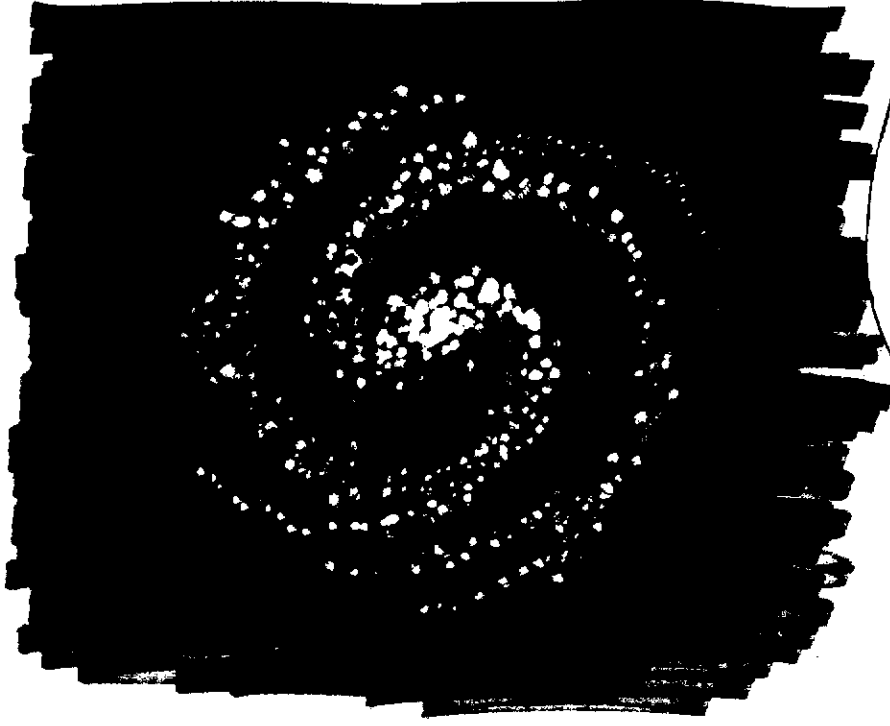
SERWAKIRA ZO MURI INIVERI

Muri za serwakira zo kw'isi, impinduka y'ibanze ni ntanteye, ariko atimosiferi, irimwo ububobere, noneho rero **MBURAKICYARO**, yerekana fenomene hakoreshejwe iyegeranya ry'umwotsi w'amazi.

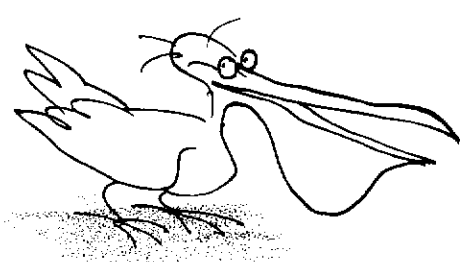


Mu ama galagisi, impinduka nyanzengurukaho mbanziriza nayo ni ntanteye, ariko gaze mpagatiranyenyeri, **MBURAKICARO**, yerekana fenomene hakoreshejwe itangizwa ry'iyegeranya rya matsiyeri.





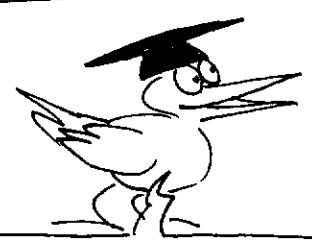
Kandi rero izo nyenyeri z'imitavu, zishyushye cyane, ziboneka gusa mu maboko nyanzengurukaho, aho zigaragaza zimurika cyane gaze mpagatiranyenyeri...



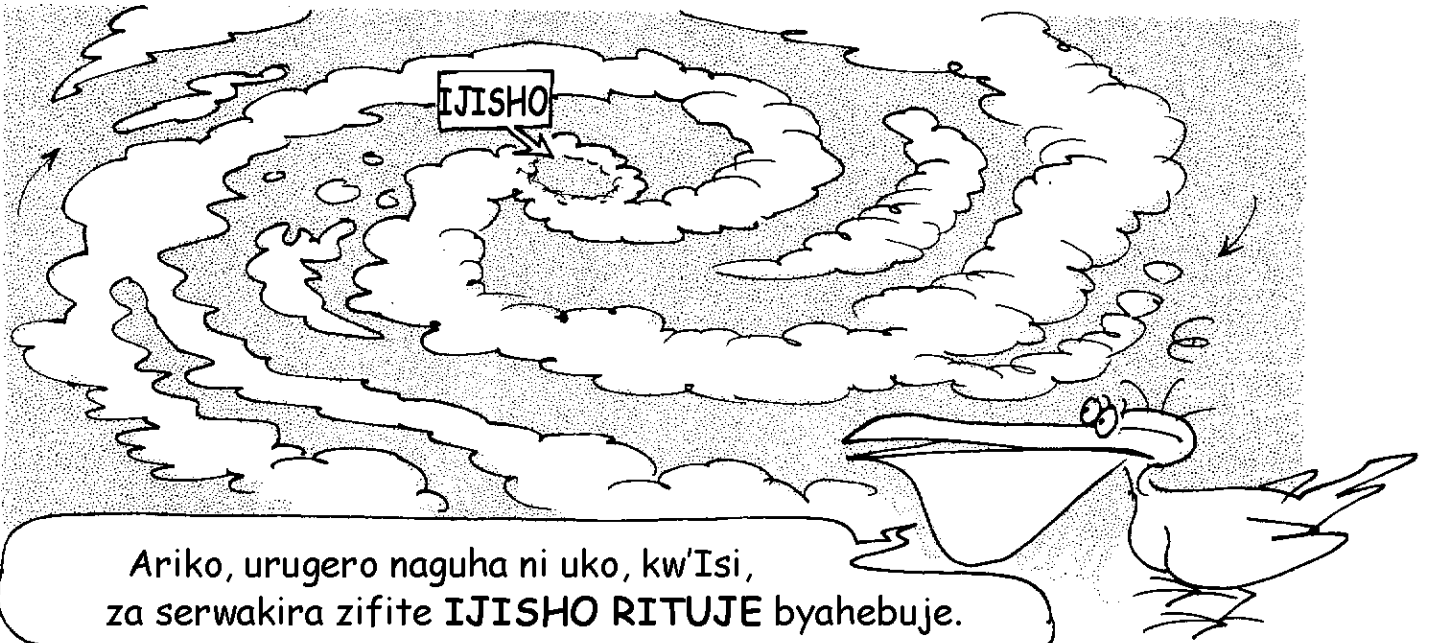
Uribagiwe, Lewo, ko izo nyenyeri zitaguma ari imitavu igihe kirekire cyane. Imyaka ibihumbi cumi iyo bikabije. Igihe cyo gutwika idorojeni nyinshi ishoboka. Iyo zivuye mu maboko, ziba ari NYAGUPFA, ziba ari gusa nk'amakara.



Kandi ntiziba zikiboneka



GAZE MPAGATIRANYENYERI nayo igaragara gusa mu maboko, aho imurikwa cyane n'izo nyenyeri z'imitovu. Nyuma y'aho, imaze gusohoka mu maboko, iyo gaze isubira kwijima.



Ariko, urugero naguha ni uko, kw'Isi, za serwakira zifite **IJISHO RITUJE** byahebuje.

Ehe, by'ukuri, tekereza wowe ko za galagisi nyanzengurukaho, izo za serwakira za **PALANETE-INIVERI**, zifite na zo **IJISHO HAGATI** !

NYIZENGURUKAHO NYAWITURUKAHO

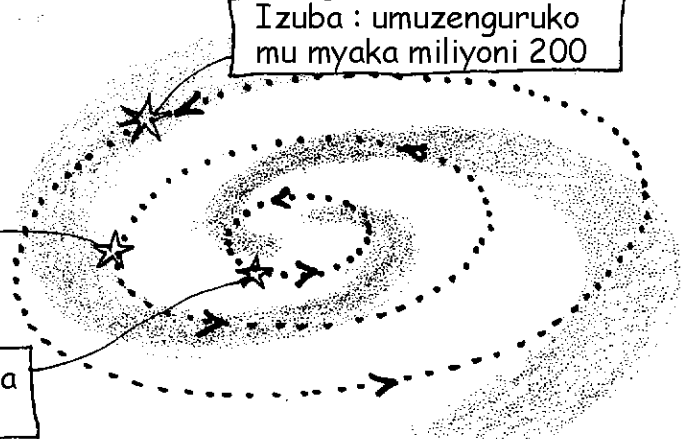
Tugaruke ku gikombe cy'ikawa

Nko mu gikombe cy'ikawa, ibintu, muri galagisi, ntibizenguruka **K'UMUVUDUKO NYAMFURUKA** umwe. Izuba, riri k'umusozo wa galagisi, ukora ubuzenguruke bwa galagisi yacu mu myaka miliyoni 200.

Izuba : umuzenguruko mu myaka miliyoni 200

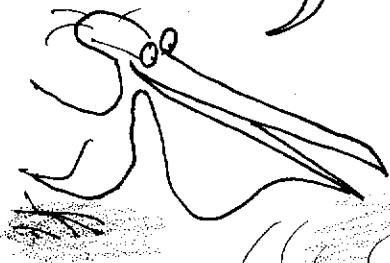
Umuzenguruko mu myaka miliyoni ijana

Umuzenguruko mu myaka miliyoni mirongwitanu



Muri make igice cyo hagati cya galagisi kizenguruka vuba kurusha umusozo

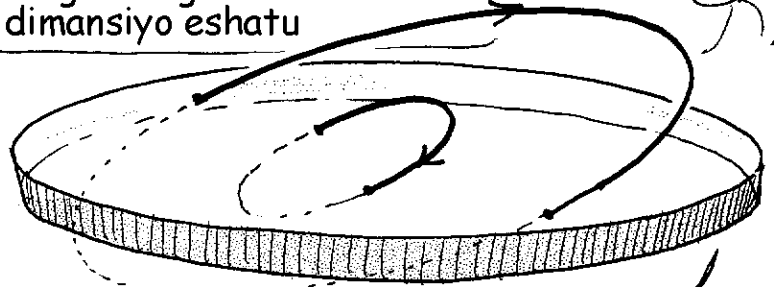
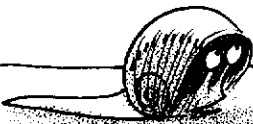
Nawe urabibona neza ko, ari amavugutiro!



Kuva Tireziyasi ahatse kuzimirira mu mwobo wirabura, byahindutse igitekerezo cy'e kitanyeganyega!

Ibyo si ubugoryi. Hari abantu benshi kandi bazi ubwenge batekereza ko hari ikinogo cy'umukara kinini hagati ya galagisi...

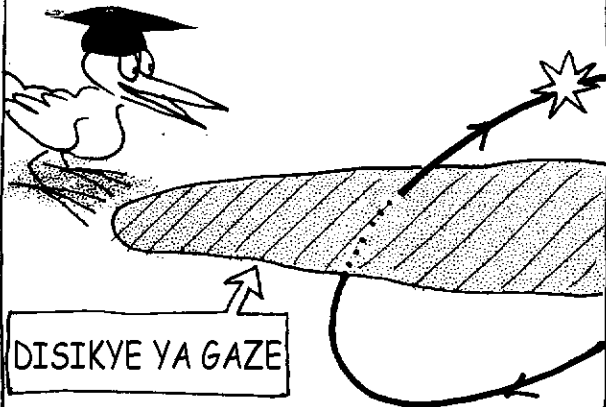
Dore galagisi "NYAYO", igaragaza ingendo muri za dimansiyo eshatu



Dukurikije igishushanyo, inyenyeri, zo ni uduce twa "gaze y'inyenyeri" (birtyo rero wazigereranya na za "molekile") twambukiranya kuri buri muzenguruko ama **DISIKYE YA GAZE**, abyataraye by'umurengera.

Ibi bisobanura impamvu injombanabikorwa akarere nyabunyenyeri-akarere mbumbatiranyenyeri, ugereraniye, ari ntagatege

Ndatekereza ko impamvu ari uku zijombana ibikorwa na gaze igihe gusa nzambukiranyaga iyo disikye ibyataraye?



Neza cyane!

ubwa mbere na mbere, hagati ya za galagisi,
hari inyenyeri nyinshi icyakabiri igihe cyazo
cy'umwizengurukaho ni gito cyane.

Biryo, muri ako karere
injombanabikorwa, itsirimana
ry'akarere nyabunyenyeri ku karere
mbumbatiranyenyeri ririgaragaza cyane.

Umuzenguruka mu myaka miliyoni mirongo itanu

Nk'ingaruka, iyi miterere
izagaragara cyane mu karere ko
hagati, kazashobora, nunashaka,
kwihindura mu **NGIGA**.

Tugaruke kuri gaze.
Ese hazaba iki ni ndeka ikimanyu cya **GAZE**
MBUMBATIRANYENYERI cyonyine ?

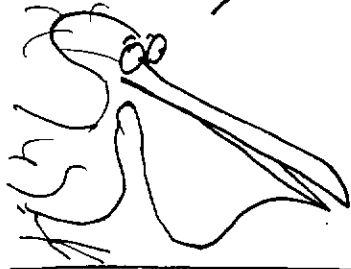
Ubuho ntabwo
tubyivangamwo !

Turebe gusa.

Gaze irakonja bisanzwe
kubera kurekura imirasire.
Uburebure bwa Jinisi buragabanuka
noneho ikicamwo ibice.

Mu maboko y'amagalagisi,
gaze ifite kandi ingeso yo kwiyegegeranya
mu bimanyu binini bifite reyo ingana na
REYO YA JINISI (*)

Ariko ibyo bimanyu bya gaze bizakomeza gukonja ari nako byohereza umurasire ?



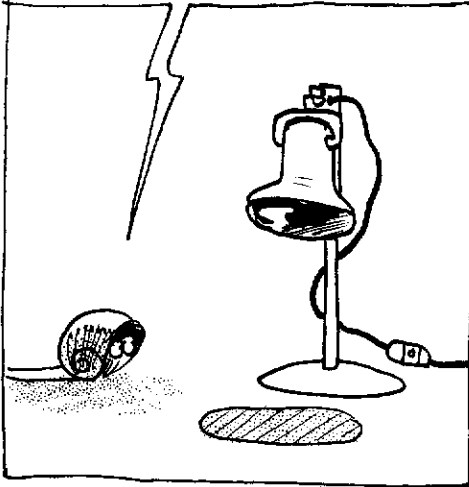
Yego, ariko inyenyeri z'imitavu zivukira muri ibyo bicu zongera zikahasuka ingufu buri gihe.



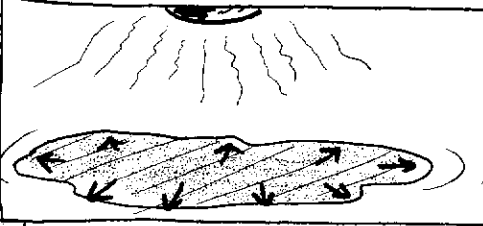
Ugiye kubibona. Tugiye gukora amageza. Ndafata itara rya indengera-viyole.



Ugiye gutara ikimanyu cya matsiyeri mbumbatiranyenyeri ?



Dukoresheje ubwo bwoko bw'umurasire, usimbura uwoherezwa n'inyenyeri z'imitavu, zishyushye cyane, ndashyushya icyo kimanyu. Uvuze **UBUSHYUHE** aba avuze **ISUNIKA**, kandi ubwiyongere bw'isunika rya wo ry'imbere bukwedura icyo kimanyu cya gaze.



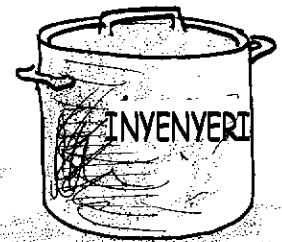
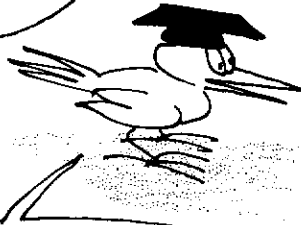
iyo iyinjizwamwo ry'ingufu rikozwe byihuta, nshobora, ahubwo kandi, kunyanyagiza matsiyeri y'ikimanyu nkimenaguye.

Hari ikibazo kitarabonerwa igisubizo: **INYENYERI**, ni IKI ?

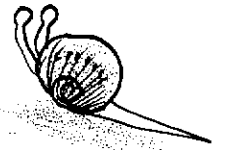


FENOMENE NYABUNYENYERI

Hagati mu kimanyu cya gaze,
ibirango by'igipimo cy'ubushyuhe
n'ikisunika bihinduka k'uburyo idorojene
IKAMATANA kandi ikarekura
ingufu nyinshi.

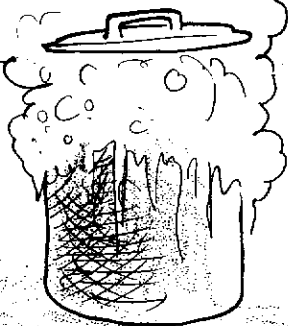


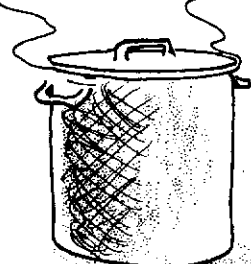
Icyo cyongera **ISUNIKA** hagati na hagati
y'inyenyeri. Nti wibagirwe ko isunika ari gusa
igipimo cy'ingano y'ingufu ugabanije
igipimo-ngero cya volime



Muri make rero, **INYENYERI** n'ink'ubwoko
bw'inkono yicana, ikishyushya ubwayo yonyine.


Uburebure bwa **DIYAMETERO** y'inyenyeri
bujyana n'ingano y'ingufu zoherejwe. Akokanya
nyuma y'ivuka ry'inyenyeri, iba ifite idorojene nyinshi
cyane muri yo. Iraka cyane bya busazi kandi
igatumbagana mu kanya gato



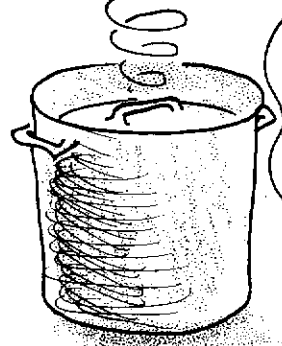


Hanyuma biroroha na ya nyenyeri ikinjira mu gihe kirekire cy'umutuzo, urebye, muremure.

Umunsi umwe idorojene ikaza kubura



Rimwe na rimwe iracana bucyе bucyе.



"umupfundikizo" urongera ukifunga, ni ukuvuga ko ya nyenyeri yi **YEGERANYA**. Indemere n'igipimo cy'ubushyuhe bikiyongera, bikiyongera.


Kenshi rero, iyo nyenyeri iraturika, kuko inkurikirabikorwa z'ikomatanana, zisamura eliyomu yakozwe, igakurikizaho karubone na silisiyomu, noneho izo nkurikirabikorwa zigatangirana umuvuduko mwinshi



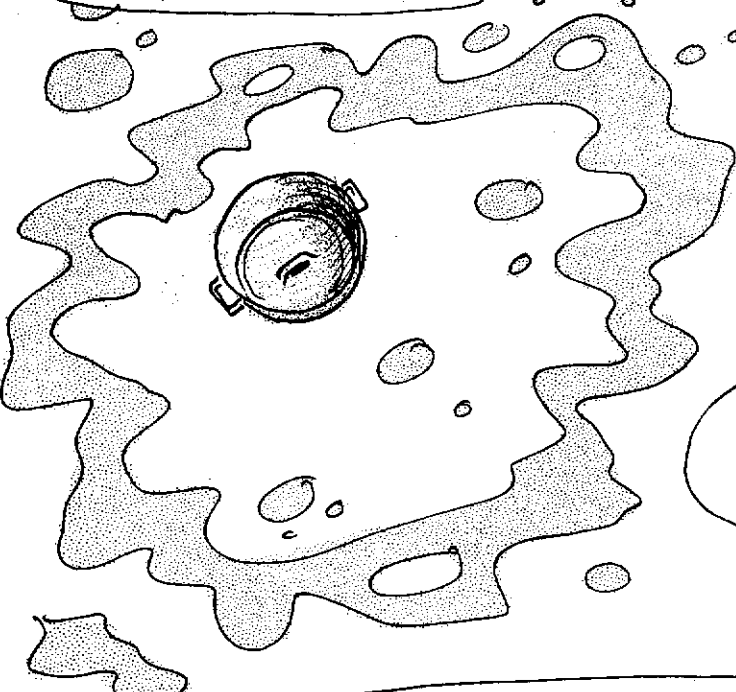
BULUCE!



Inyenyeri ihinduka **SUPERINOVA**



K'ubwamahirwe, ubwo bwoko bw'iby bintu buba, muri galagisi, rimwe mu kinyejana!



Umupfundikizo wongeye kugwa mu ndiba y'inkono. Hasigayemwo akantu k'amabwabwa. Mbega iherezo ribi.

Ariko, rimwe mu kinyejana, Lewo, ni umurindi wihuta CYANE. Tekereza ko galagisi yizengurukaho rimwe mu myaka miliyoni 200.

Yebaba we, ibyo bizatanga miliyoni ebyiri za SUPERINOVA ku...muzenguruko ?

SUPERINOVA
zi jugunya amakara yazo mu majana y'imyaka-rumuri (*)

Nk'uko ziturikira ahariho hose n'igihe icyaricyo cyose, superinova zitera akavuyo gakomeye mu karere mbumbatiranyenyeri...

Kandi se izo superinova zaba zisubira kugaburira nazo ingufu, gaze mbumbatiranyenyeri ?

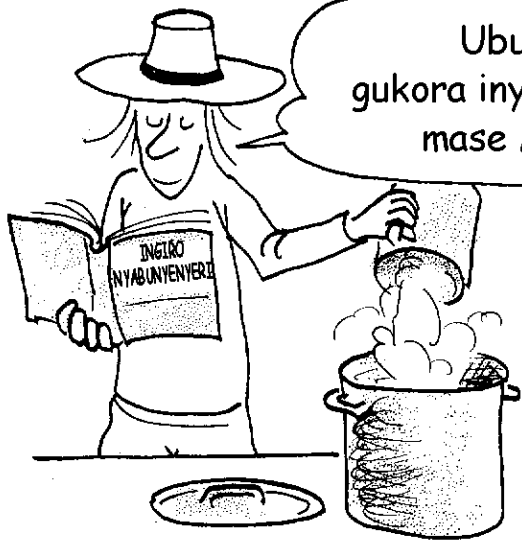
CIPAFU !

Undi kandi byananiye

CIPAFU !

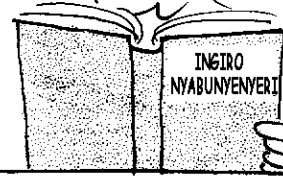
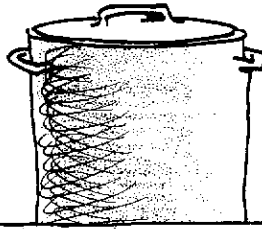
Tujye gushaka ahantu hatuje.

AMOKO Y'INYENYERI



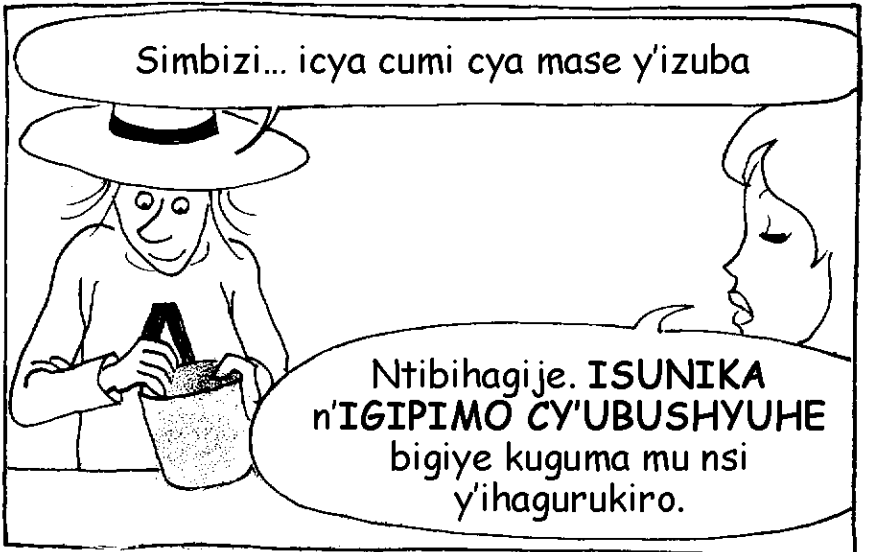
Uburyo bwo gukora inyenyeri: gufata mase M ya gaze.

Gutwikira. Kureka hagacaho imyaka 100 000



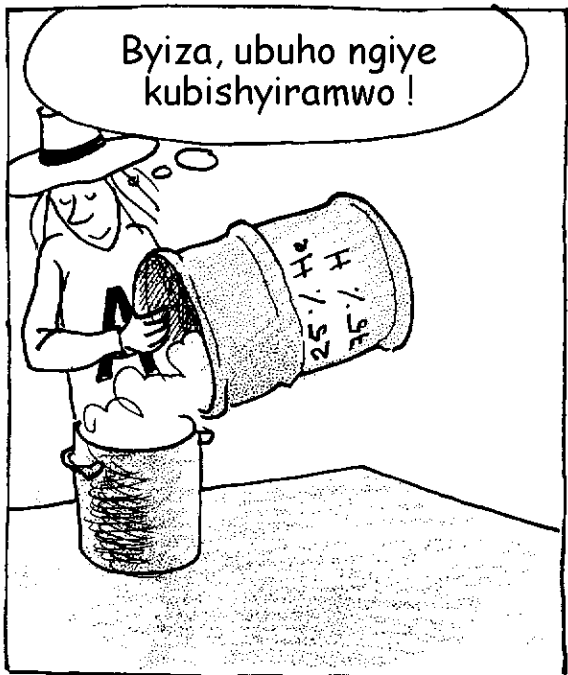
Yebaba we, haciye umwanya utari muto ntegereje. Kandi ... ntabusa !?

Washyize yo zingaha ?

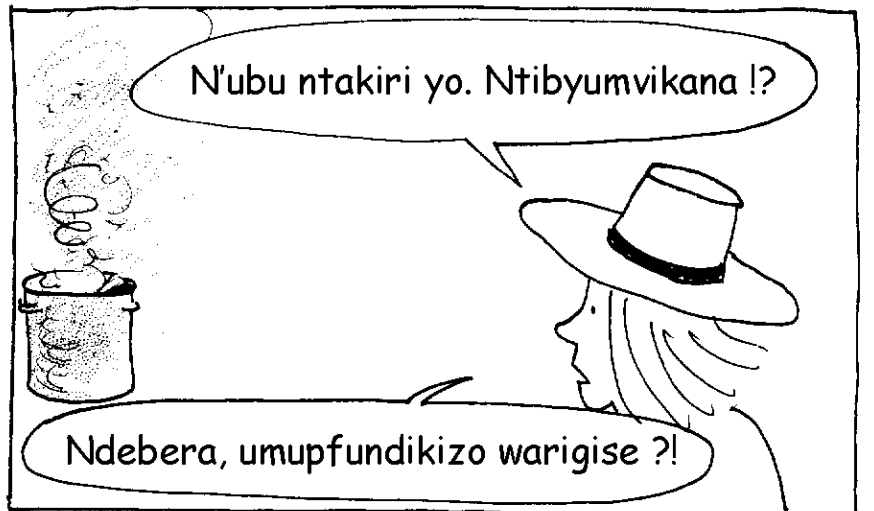


Simbizi... icya cumi cy'a mase y'izuba

Ntibihagiye. ISUNIKA n'IGIPIMO CY'UBUSHYUHE bigiye kuguma mu nsi y'ihagurukiro.



Byiza, ubuho ngiye kubishyiramwo !



N'ubu ntakiri yo. Ntibyumvikana !?

Ndebera, umupfundikizo warigise ?!



Twungutse ! **UMWOBO WIRABURA** umwe !

Inyenyeri-rugero ni igice cya mase nyabuzuba

Ahaa, ni ukuri ! hamwe n'iyi esipase idakomangatanye...



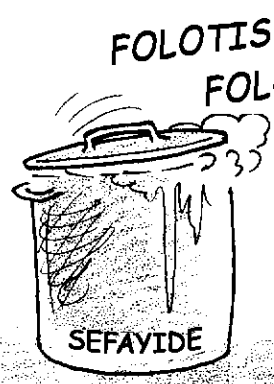
Dore. Nyuma y'iyi ntera yumye ho gato yo gucana, inyenyeri ihita ishyikira imyakire yayo ikataje.



**FOLOTISHI
FOLOTISHI
FOLOTISHI**

Cyose, ni iki kandi ?

SEFAYIDE



**FOLOTISHI
FOLOTISHI**

Wakoze **INYENYERI YIHINDURANYA**.
Diyametero yayo irahinduka buri kanya kandi, kuri buri yegeranya, irekura itama ry'urumuri.

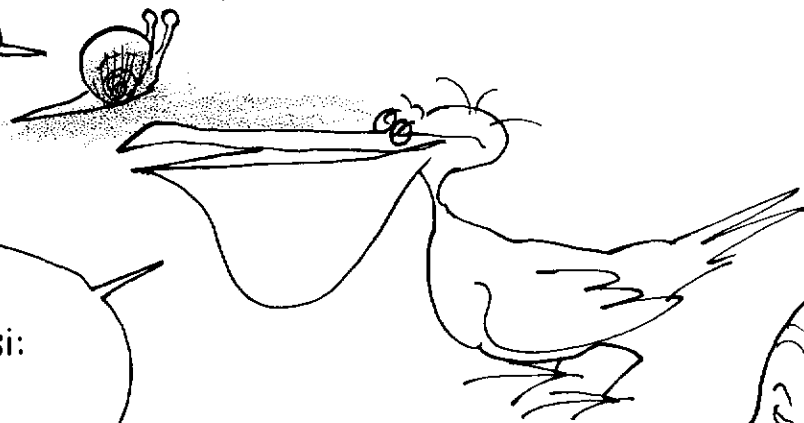
Uko mase ya **SEFAYIDE** ari nini ni nako ubugarukire bwayo ari burebure. Incandago (paralagise) mu rugendo ryatumye bakoresha izo nyenyeri mu gupima urugendo rudutandukanya na galagisi ya Andromede.

Ubuyobozi

Uko inyenyeri **IREMEREYE**, ni nako ibyiruka **N'INGOGA**.
INYENYERI yo mu bwoko bw'izuba ishobora kugurumana
mu mahoro mu gihe cy'ama miliyaridi y'imyaka, naho inyenyeri
y'umutavu, iremereye, ikoresha idorojene yayo mu miliyoni imwe
y'imyaka. Therezo rya yo ni uguturika



Inyenyeri
ziremereye ni inyenyeri
z'ibibazo



Ngiye kubaza
ikibazo nka Tereziyasi:
INYENYERI
ZIMARA IKI !



IKIBAZO KIZA CYANE !

Mu nda y'inyenyeri nuwayo z'atome
zihura n'amasunika akomeye cyane.
IKOMATANA ry'ama nuwayo
ane ya idorojeni atanga...



... eliyomu

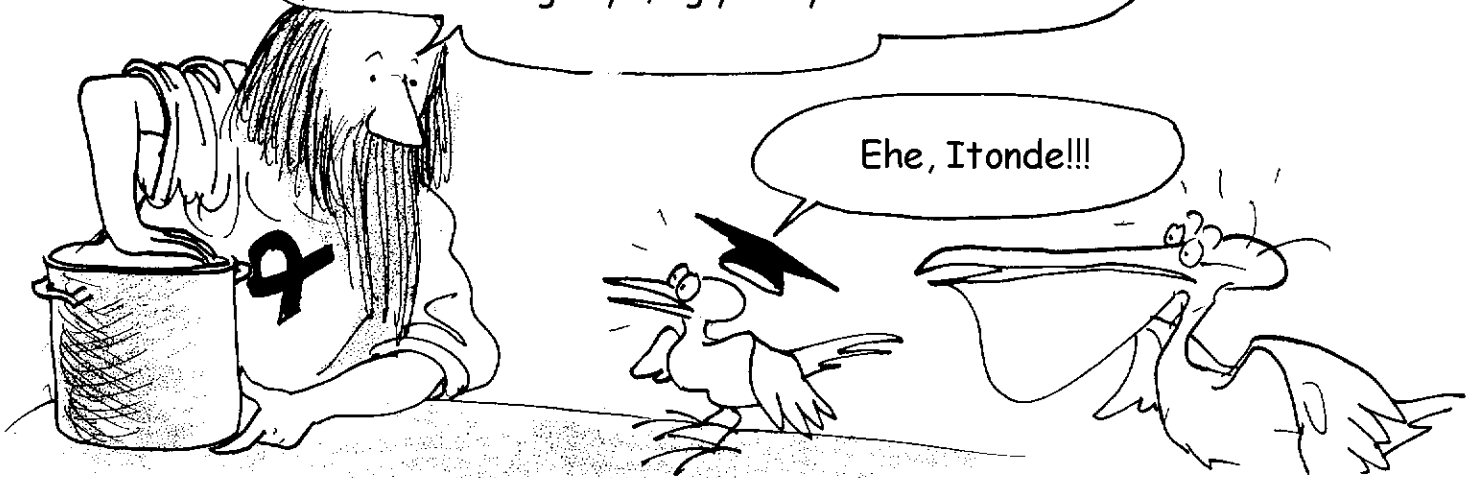


61

IMBUTO ZA INIVERI

Iyi nyenyeri iri hafi cyane y'igihe
k'ihungabana. Yacanye idorojene yayo yose.
Igirayo, ngiye kuyatsa

Ehe, Itonde!!!



Byiza
siko ?

Izina
ry'Imana!



Dore. Hasigaye
kuyora oguzijene,
feri, silisiyomu,
atome zose zo
ku rubahu rwa
MENDELEYIYEVE

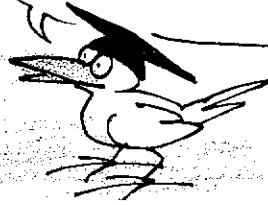
Ariko se, iyi
NIKELEWOSENTESE,
ni iyo gukora iki ?

Kugirango
hakorwe
uBUZIMA

Ama atome aremereye ariyegeranya kugirango atange **IMIKUNGUGU** mito cyane, imwe ibonwa na mikorosikope.....



... azakora **NK'UMUSEMBURO W'UMWIMERERE** kugirango hakodwe **MOLEKILE ZA MBERE.**



iBiCU & iMVURA

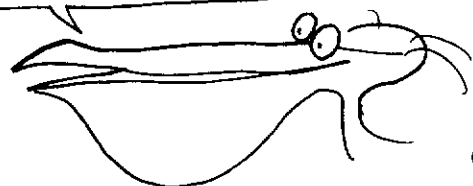
Iriya matsiyeri ijugunwe n'inyenyeri, byaba bikoze mu buryo bw'ihumeko rirandaga, cyangwa byaba bikoze mu rupfu rwihuse, byongera mase ya gaze mbumbatiranyenyeri



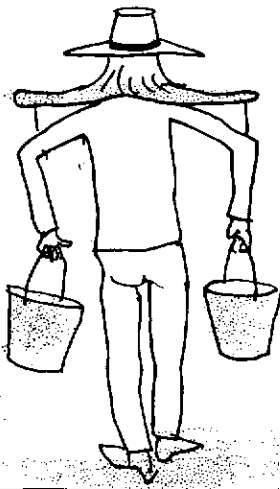
Muri make, atome, itoranjwe uko ubonye, ishobora kuba yaratuye mu nyenyeri nyinshi zinyuranye, cyane cyane iyo nuwayo yayo iremereye.

Iryo yerera ry'ama atome mu nyenyeri riyana n'iyongera rihoraho ry'**UTUGINGO TUREMEREYE** urugero ni utw'ibyuma : Feri, Nikeli, Kwivure

Rero, uko inyenyeri zirushanya kuba **AMATAVU** ni nako zirushanya ubukire mu **BYUMA** !



Anselimi, uriho urakora iki?



Ngwino tujyane



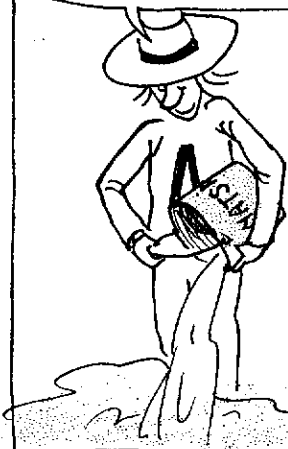
Uyu ni umwanya wo gukusanya ibyo tuzi byose ku amagalagisi.



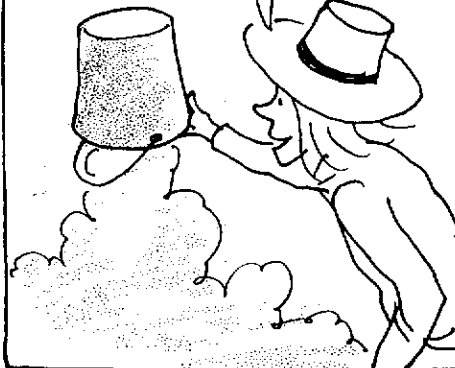
Hano mfite ibigaragaro byambere byiza by'umwitegererezo.



Matsiyeri. Ubwa mbere inyenyeri miliyaridi Magana abiri



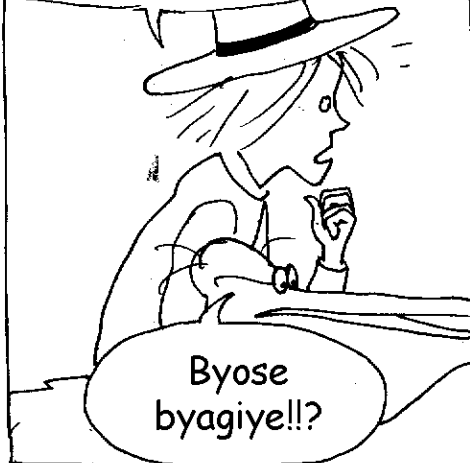
Gaze nke ya mpagatiranyenyeri



Tuzengurutse iryo tsinda

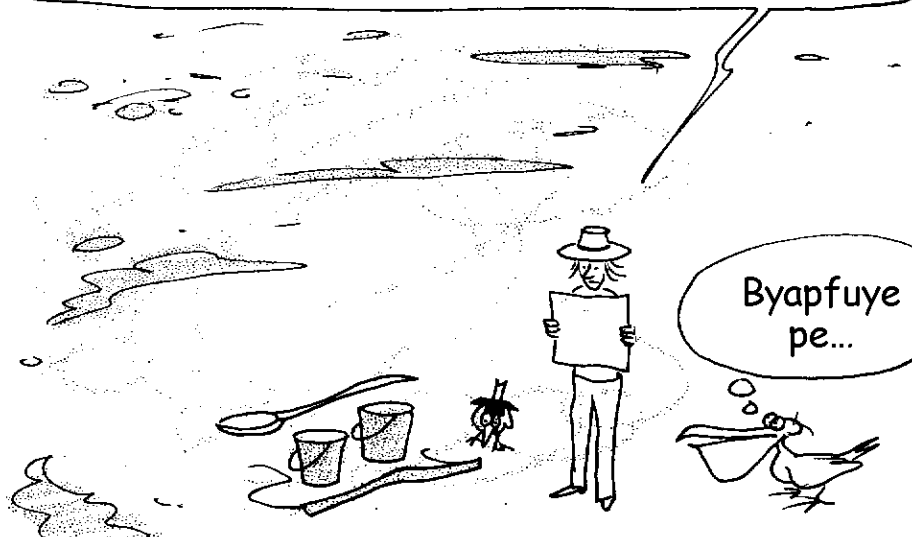


Ariko ... habaye iki?



Byose byagiye!!?

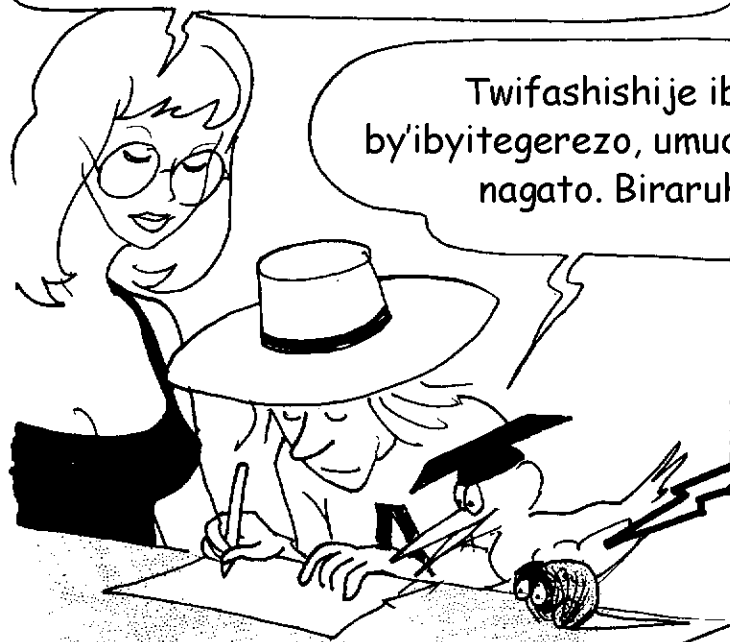
Sofiya, mfite agahinda. Galagisi yanjye yaturitse yose. Ibiramambo nari nakoresheje ibigaragaro by'ubwitegererezo bya vuba cyane!



Byapfuye pe...


MASE iBURAHO

Muri iyo nserukiro, ingufu nyikururiraho ni nini kurusha ingufu nkurura nyagavite. **MASE** ikoresheya **IGABANIJEMWO INSHURO 2.**




Twifashishiye ibipimo by'ibyitegereze, umudeli ntuhura nagato. Biraruhije...

Mu yandi magambo :
ZATAKAYE, INYENYERI MILIYARIDI 200. INKURU YOSE ITUMA DUSUBIRA KUBONA IYO MASE IBURA YAKWAKIRWA NEZA.



Umuntu abara ibyo **ABONA**

Ku bijyanye n'iherezho ry'ubuzima bwa yo, igihe ijugunya igice cya mase ya yo, inyenyeri izabaho mw'iforoma y'insigarira yitwa **IGIKURI CYERA** cyangwa **IGIKURI CYIRABURA**, muri rusange iba icana buhoro k'uburyo itagaragara.

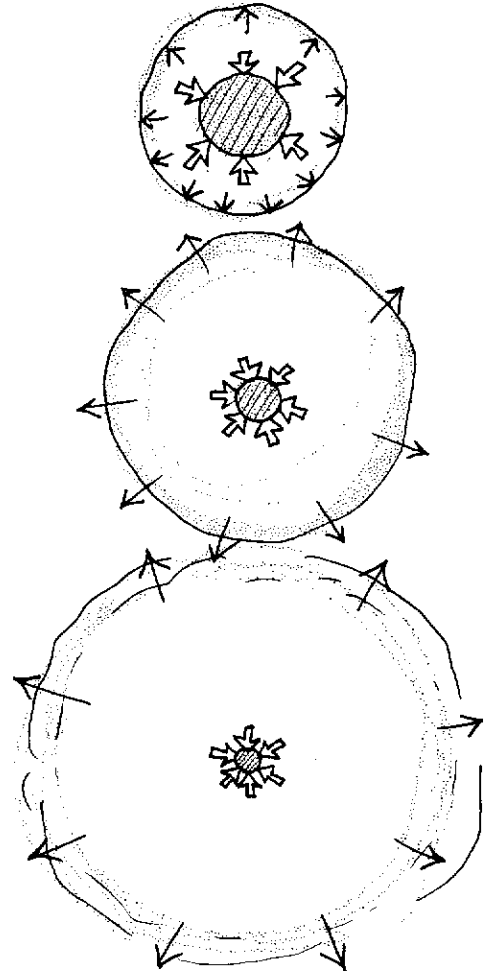


Bishatse kuvugako twaba tudagishobora kumenya **MASE ITABONEKA** yerekanwa n'ariya mavu y'inyenyeri mbanziriza, zaba zarakorewe igihe kimwe na galagisi.

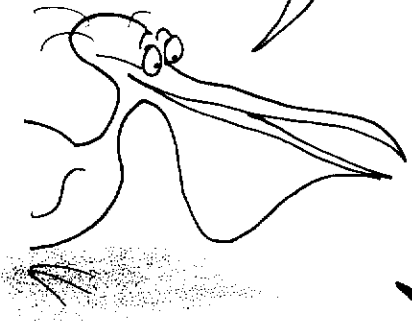
Mwiherezo ry'ubwoko bwa
SUPERINOVA igishishwa cy'inyuma
cy'inyenyeri kiraturika. Ikomatanyangaruka
ribiturutseho rishobora gutsindagira
nuwayo yo hagati k'uburyo iyihinduramwo
UMWOBO W'UMUKARA.



Kandi
ibindi ibintu
bizihisha abashaka
kubyitegereza



Ese haba hasigaye inyenyeri mbanziriza,
zavukiye igihe kimwe na galagisi kandi
zo zishobora kugaragara ?



Yego nyine rwose hariho,
mu magalagisi, inyenyeri zishaje zibumbiye
mu **MATSNDA NYABUSARO**, kandi zimurika
kuva miliyaridi cumi n'eshanu z'imyaka.
Kandi izo zirahari mu magalagisi yose
kandi zavukiye igihe kimwe.

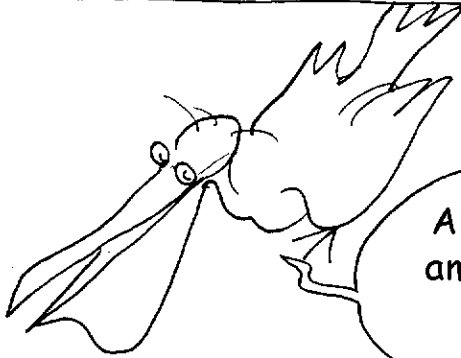


Naho izindi, zanyanyagijwe mu mpande ennye za galagisi, cyangwa zahindutse ibikuri, byera cyangwa byirabura, cyangwa zahindutse imyobo yirabura itagaragara

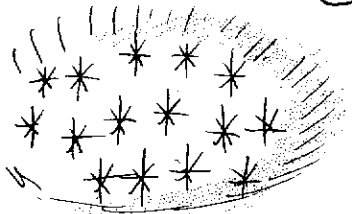


AMATSINDA Y'INYENYERI

Itsinda nyabusaro ni umuterere w'inyenyeri ibihumbi ijana, wabayeho kuva galagisi ikivuka (*)



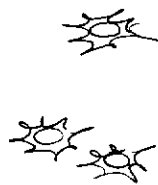
Ariko za galagisi zanyanyagijwemwo amatsinda nyabusaro mato y'imitavu, ariho arashwiragizwa m'uburyo ugereranije bw'akarindi kihuse.



Ayo matsinda mato agaragaza ibibaya bifite inkombe zizamutse buhoro aho inyenyeri, zisunikwa n'amasekurana akorwa mu kavuyo, zizashobora gutoroka ugereranije mu buryo bworoshye.



Igihe itsinda ryashwanyutse, inyenyeri ziritemberera muri galagisi mu kavuyo, ziri zonyine cyangwa ziri mu matsinda y'ebyiri (INYENYERI EBYIRI)



(*) umwanya wo kuyonga kw'itsinda nsekurane uhinduka mu buryo bumwe na mase ya ryo.



Ishyirwa hamwe z'izo nyenyeri ebyiri, za mase zijya kungana cyangwa zirutana cyane, ni sisiteme **ZIDAPFA GUHINDAGURIKA**. Izo sisiteme nyabubiri, nyishi cyane mu magalagisi, ni ikimenyetso cy'isano mbarizwayo rya kera mw'itsinda ry'inyenyeri.

Ndibaza ko amagalagisi agomba nayo kuba atakaza buhoro buhoro inyenyeri z'ayo?

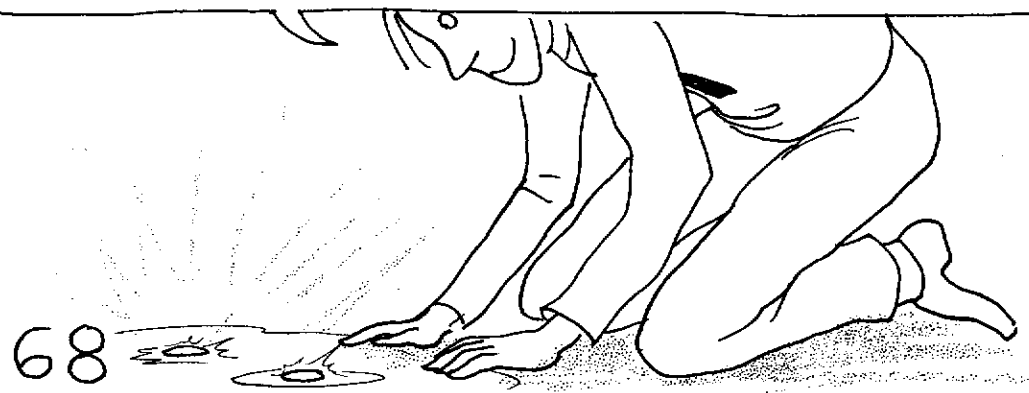


Kubera icyo, birasabako inyenyeri zakira imivuduko y'umirengera, iruta umuvuduko w'itoroka, biciye mu mukino w'**AMASEKURANA**. Ariko, zinyanyagijwe muri galagisi, inyenyeri zirema rwose ihuriro **NTASEKURANA**. Ntizigera zihura na rimwe. Birtyo rero za galagisi ntizitakaza inyenyeri

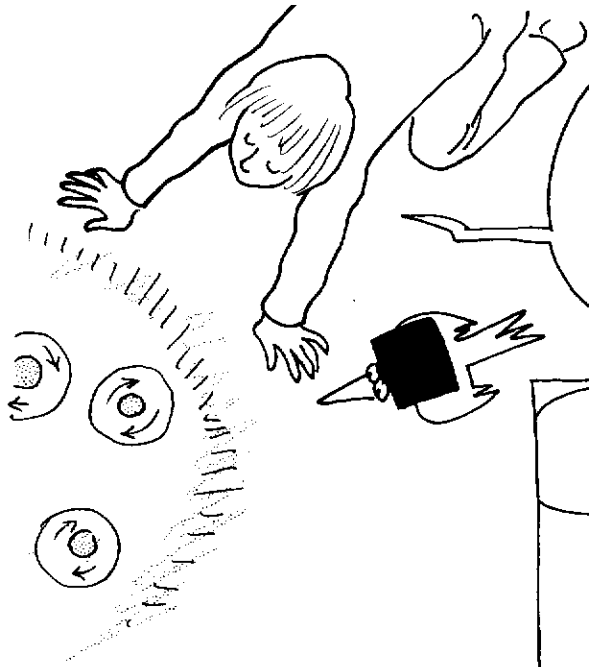


Guhora utwara byose, ibyo ndabikunda...

Nditegereza iri tsinda rito ry'inyenyeri zikimara kuvuka. Ubirebye neza zitwara nk'amagalagi y'imitavu yacu. Zirashyushye, zikikijwe n'agahu gato ka gaze n'ivu : umwuka wazo, mu yandi magambo...



AMAPALANETE

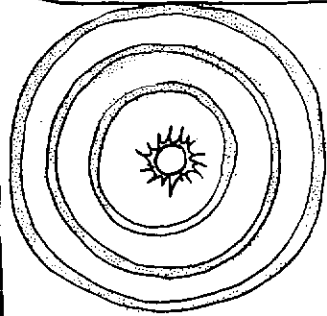


Inyenyeri z'imitavu zacu zihora zigenda zigaruka muri iri tsinda rito, nk'amagi kw'isahane cyangwa kw'ipanu iriho amavuta ahagiye. Amasekurana ya zo atuma uducu duto tuyakikiye twizengurukaho.

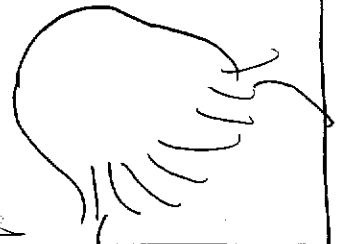
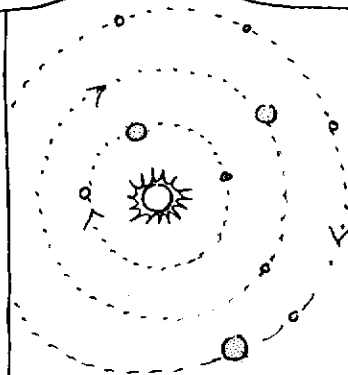
Itsinda ryashwanyutse nk'ihundo ry'imbuto. Inyenyeri zaratuje. Ndi imwe muri zo



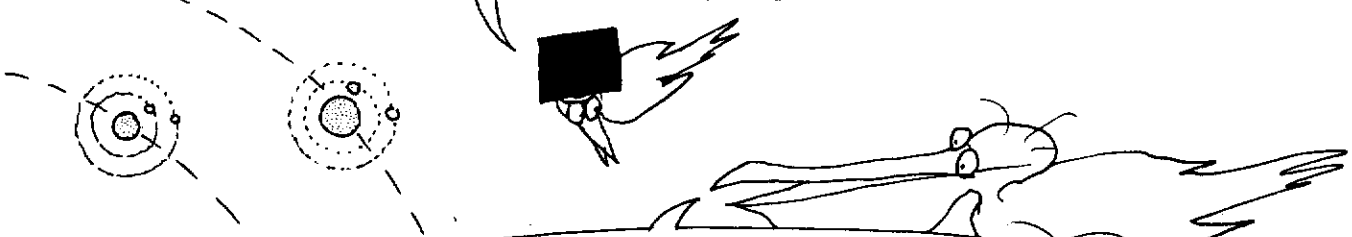
Ingufu nyizengurukaho zibuza imikungugu y'agacu kugwa ku nyenyeri. Iyo mikungugu irikoranya mu mpeta zisangiye akadomo ko hagati.



Kuri buri serikyeri, buri muzenguruko, hirema **AMAPALANETE**.

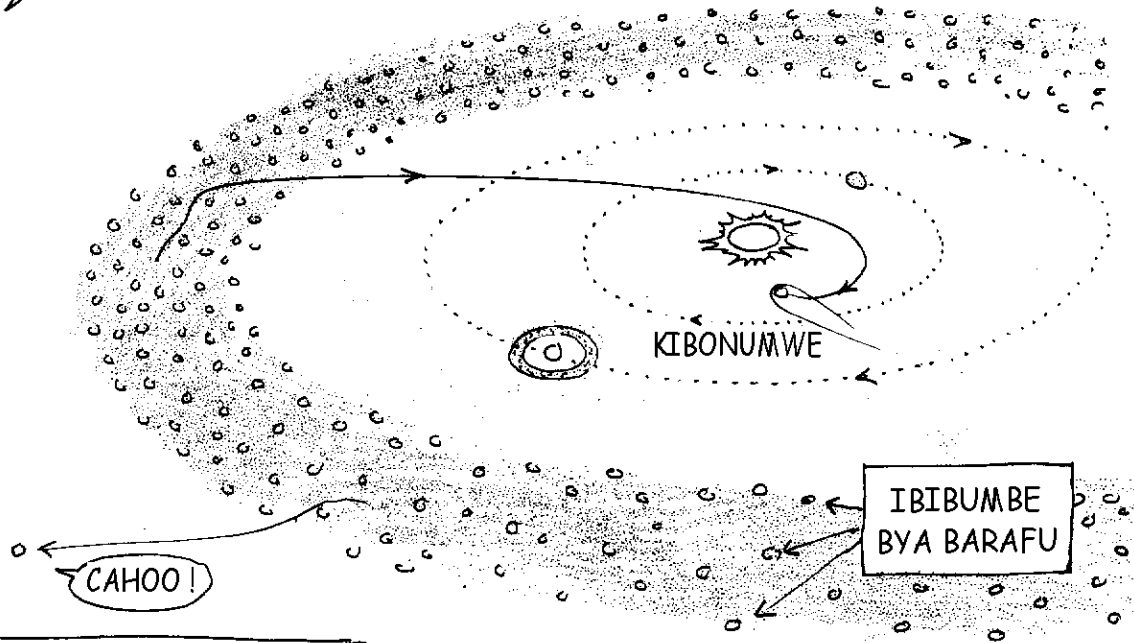


K'umuzenguruko umwe, palanete nini kurusha izindi izikururira palanete z'uburemere buke kurusha izindi kugirango izigire amasatelite ya yo.



Nguko rero. Inkuru ikaba irashojwe.

Igice **NYAMWUKA** cy'iyiyo **ATIMOSIFERI NYABUNYENYERI MBANZIRIZA** iziyegeranya mu bwoko bw'**AGACU KA BARAFU K'UMWANDA**. Rimwe na rimwe, isekurana riraba, hagati y'utugingo tw'uwo mukandara. Biryto rero icyo kibumbe hari uko kyihuta kikarenga **SISITEME NYAZUBA**. Cyangwa rero kikagenda buhoro noneho, mu "kugwa" kikagana hagati ya sisiteme, kigahinduka **KIBONUMWE**.



Ese iyaba twari tugiye kurebera ayo ma**PALANETE** tuyegereye?



Iriho iratapfuna **IRANIYOMU 235 NYARADIYOBUKANA** yacakiye ikiremwa

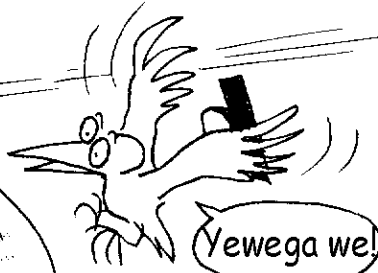


Aho rero !? igihe k'iremwa ryazo,
ama palanete yari ama **REYAGITERI**
NYANIKELEYERI!



POLOCI !

Kuki **ZARI** ?
Ziracyari byo n'ubu,
n'iki gihe cyose !
Wemera ute ko Isi ishobora
kugumiza nuwayo yayo
mw'itanure ?



Yewega we!

Ishyushwa kandi
n'utwo tumanyu tuyisekura igihe
iriho "**IRAKORA ISUKU**"

Tujye kubireba tubyegerereye noneho hafi cyane



Anselimi, ntegereza !!
itone, iruka ry'ibirunga
riracyari ryinshi



Aha, kiriya...
ibyaribyo byose
umutwe
urubitse !

Ubwo rero, Tireziyasi...
umurizo wawe wongeye kwizinga ?



Mi!

Muratureba rero turi ku **PALANETE**.
Imvura za karahabutaka zisiba buhoro buhoro
inkovu zasizwe na amameteworite. Hashize igihe
t= miliyaridi cumi z'imyaka kandi igipimo cy'urumuri
nyakosimosi cyaramanutse kugera kuri
dogere 4 Kelivini.



Tugiye kuzakomerereza
ku nkuru nshya: **BIYOLOGIKONI**. Hano ni Sofi,
ubavugisha ari muri Kosimosi.

UMUSOZO