

**&ci v r;Ei"av b m o a w;u s m r s m;**

**pr; a u o a t m i \***

**p m w r; t u : O;**

**pp m w r; o n & c i a u; v u a w; u A s m r s m; r & c i v r; E i " a v b m o a w; u A s m r s m;  
t a l u m i; u x w E w a v v m w i j y x n; y g o n/ a & a & t c g u r b r s m; o n o n; o r; r s m; u  
a w; u A s m j z i a c s m o y l u a l u m i; a v v m a w 1/2 & y g o n/ x " a v o n o m; o r; E i r b  
o a, m Z O a E m i u l; u c i l r a p o n/ r b E i o m; o r; & i t y r u m a e & u m r b p u m; u  
e m; a x m i l y; v u; o r r s m; u v n; 1/2 a o l u o n/ v v r m v, O a u; u a v; r s m; v a w m  
v a u m i; r s m; j z p v m l u o n/ , c t c g x " a v x; w r; p O v m w o n a r; r e a y s m u q;  
a e l y; r b E i o m; o r; ? & i t y r u m a e c e r & o e o i q; r c e e n; y g; l y; r, O a u; a o m?  
t j r i u s O; a o m r b E i o m; o r; u m [ v n r r s m; u o w i y q i j c i r y g o n/ x a l u m i  
w p c w w p c g u & c i v r; w l - r b E i o m; o r; c s p p & m " a v r s m; j z i o a C m Z O z l a E m i  
a e x i c l u y r s m; u a z m x w w i j y v a o m & n 1/2, c u j z i p p m w r; u z w l u m; w i o i;  
& j c i; j z p y g o n/**

**a o m c s u p u m; v; r s m; / & i t y r u m? " a v x; w r; p O v m? w p a c w w p c g? v a w m  
v a u m i; ? c s p p & m " a v /**

**e' g e;**

**r E ó a A' y n m & i r s m; \ o y n m t &? o a w o e r w w r; r s m; w i t a y g i; t a z: w E i  
p n; v; p m a e x i u i u v m c r a l u m i v r y; a y g i; a q m i 1/2 u j c i; o n t a j c c i v m o n [   
q a v o n/ x r w p q i - v w p p? v w p p r v r s l; w p p? v r s l; w p p r t r s l; o m; w p & y [ í  
j z p a y: v m o n/ p o n o y y n m & i w \ v r s l; p w p c r t r s l; o m; w p & y [ í j z p a y:  
v m o n, q c u u u r m v r s l; w i; t o; o; u a x m u c v u s 1/2 l y; j z p o n/**

**& c i j y n e, o n v n; ? & c i v r; r s m; ? v r p a y g i; a q m i 1/2 u a & r t a j c c i v m l y; & c i  
v r s l; t y p o n u, r i; u, c s i; t j z p u, x; u, e e; j z i b & i t q u q u t y c s y  
v m c a v o n/ p o w i; j y n w p j y n \ v r s l; t y p o n t o i; t O e; ß u; p m j z i r l y r y u  
v r s l; r w r a u m b w n 1/2 a e E i c i j; j z p a y o n/**

**1/ & c i j y n e, E i & c i v r;**

**& c i j y n e, o n j r e r m E i i \ t a e m u 1/2; r a w m i w e; E i b \* v m; y i v, a t m  
l u m; w i w n 1/2 l y; a j r m u b u ü c i; j y n e, ? a w m i b u ü { & m O w w i; a' o ß u; ? t a & l b u ü  
& c i 1/2; r a w m i w e; ß u; E i t a e m u b u w i b \* v m; y i v, a t m w l O i; & v u 1/2 o n/**

\* a' g u w m? w z u y g a r m u? j r e r m p m X m e? & e u e e n; y n m w u o v

&ciyne , on {& , mpw&e;riaygi; 12800ceus , 0e;on/ &ciyne , erw  
yiv , ur;½;we;on ewjrp0r \*acsmi;jrp0awmibu ausmucleacsmi;0tx tvsm;  
riaygi; 300ce &nvs; í ur;½;we;wpavlm uwi ausmuaqmirms; xxyvontji  
yiv , au<sup>1</sup> yiv , atrms;Ei ue;rsm;vn; aygrsm;von/<sup>1</sup>

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a&mujci;}} [ t"yg , &ygon/ &ciwon yiut m;ji A'bomui;½;i;orsm; jzp&m  
A'pmayvr;r;aom ]]&ui}} trnu&cixuyí Epouluon/ ouwpmay vr;r;r½  
aomacwwi &ciynnu]]tm&uma'o lm}} [ac:aumi; tmeEpE&m; ausmupm taxmu  
txm;t& o½&ygon/<sup>2</sup>

tE,wi;om;wu &ciynnu ]]tm&ue}} [ac:on/ 4i;pum;on ouw  
]]tm&um}}r qi;ouv m[e½on/ tE,om;o; ]]tm&ue}} rwpqi taemuEiion;  
wu&½ly; &ciynnu ]]tm&ue}} [ac:vmon/<sup>3</sup>

&ciwon rrwXmeu b&uijyn (or[w) ]]b&cijyn}} [ tjrrwE;  
ac:luon/ pci;Ei;ym urmay:wixi&m;aom jyiop? \*smre? t&e? tmz\*eeppwe?  
u&; , m;? A , uervrsl;wEi qiwon/<sup>4</sup>

oijyivUPmt&lunvi &ciwontrsm;t m;ji tom;ñon/ ru&pEi  
Emway:on/ t&ytarmi;rm rerrrijzpon/ oawotcsUu &ciwon  
ti're\*vu<sup>5</sup> tE,0ijzpon[ quon/ oawo\*&uzawvm re\*v , m  
(re\*vu)won tm& , etE , r qi;ouv mcon [ , qcon/<sup>6</sup>

&civrs;wonyiut m;ji pwoabmxm;aumi;luon/ yivi;½;om;luon/  
rs;½;oepiru tx;Epouluon/ ao;a&mEmru rvvm;luac/ tp0tv m½;&mu  
vuc , lunwwluon/ A'bomu u;u , ui;½;i;luon/ xalumi&ciwon  
trsl;u;vn;aumi;? ovuvn;aumi; apmia&maomvrsl;tjzp xi&m;on/ oijzpí  
toiem\*Earmue;wi&ciu ]]trsl;ov? EpXmeu jyn0r@xi? apmipr;Eion? &ui  
emrbrrnvjzi tEwonm? ac:ty&mwn;}} [ í rwwr;wixm;ygon/<sup>7</sup>

A'0ivumüvn;aumi; &civrs;u ]]ule;wiZrL? vwi&ui? êuibowi;  
ui;b t jyp? cspont rsl;? êu;onv v? jrwpm\*Ei Ep0ewv? cplunjlLon?  
eAlqawmi;? jyntwn;}} [ a&;om;xm;ygon/<sup>8</sup>

<sup>1</sup> wi;&i;om; , Oau;r½;&m"av x;prsm; (&ci) 1976? 13/

<sup>2</sup> - , i;? 36/

<sup>3</sup> jyne , jzpp0ori;? yxrw? 1984? 50/

<sup>4</sup> - , i;/

<sup>5</sup> Indo-Mongoloid

<sup>6</sup> Griffith Taylor

<sup>7</sup> jyne , jzpp0ori;? yxrw? 1984? 49/

<sup>8</sup> - , i;/

o|jzpygí &ciyje, on a&twawuwn;u wn<sup>1/2</sup>vr &civrsl;qon  
rmvn; pmayur;\*rtaxmutxm; t& <sup>1/2</sup>;om;jzlpion vrsl;jzponrm xi&m;ygon/

2/ &ciau;vu"avbmomaw;u<sup>sm</sup>

urmay:<sup>1/2</sup>vrsl; to;o;wü rrwu, yi, Oau;r? <sup>1/2</sup>&m"avx;pyjyirsm;? Pmay  
tEynm? aw;oci;rm;? uAsmrsm;ponw<sup>1/2</sup>uplr jzpygon/ vrsl;wprsl; \ "avx;p?  
bmomt, Og"? taw;tac:wu xvrsl;rm; \ a<sup>1/2</sup>;aw;uAsmrsm;u avvmjci;jzi  
o<sup>1/2</sup>Eiayon/

&ciyje, <sup>1/2</sup> &civrsl;rm;wivn; o;jcm;u, yi, Oau;r"avx;p? <sup>1/2</sup>&m  
aw;uAsmrsm;<sup>1/2</sup>uygon/ 4i;wxr x;jcm;xi&m;aom om;or;Ei rboa, mZO aEmiêu;  
ucilrapon uav;acsmaw;uAsmrsm;wi &civrsl;w\ tjc;wi;&i;om;rm;Ei  
rwon x;jcm;cursm;jzpon upm;<sup>1/2</sup>, uav;i, rm; u, wioqaom, i;ci; [on  
aw;uAsmu aw<sup>1/2</sup>&jci;jzpon/ xaw;uAsmwon vrma&jcm;<sup>1/2</sup>vmlly; toÓPziz;  
taw;tac:reueatmi uav;i, rm;t; pn;<sup>1/2</sup>vlaqmay;aom aw;uAsmrsm;tjzp  
avvmaw<sup>1/2</sup>&ygon/ x"von &ciwi;&i;om;w\ vr"avx;pjzply; , aeacwwi  
tm;en;aeon rbEiom;or; um[vmrsm;u owyqijcip&mtjzp avvmaw<sup>1/2</sup>  
&ygon/ xx;jcm;xi&m;aom "avbmomaw;uAsmrsm;u ppmwr;wi xwEwavvm  
wijxm;ygon/

&ciau;vu"avbmom aw;uAsmrsm;ü au;vuawm<sup>1/2</sup>mae &citrl;om;won  
rrwa'otajtae obm0x;p? pm;0waer? tvytuiaygi;oi;quqr? , lun  
u;u, rrwu tajcyí oqclujci;alumipwx;jcm;pm xi&m;&jci;jzpygon/

x"avbmomaw;uAsmrsm;u avvmjci;jzi &ciwi;&i;om;w\ vaer"avxp?  
Pwae oabmxm; , Oau;r tajtaersm;vn; o<sup>1/2</sup>Eiaygon/ au;vu "avbmom  
aw;uAsmqontwi; x;oe;oraEmb au;vuaejynovxwEi e;pyaom  
aw;om;rl;jzpygon/ xaw;uAsmrsm;r au;vua'o \ Epvz, aom lunE;cs;ajrU  
z, aumi;aom ae&ma'otjzpvnaumi; au;awmaetrsm;jynow\ jzlpiajzmirw  
aompw"mwEi cplunpn;v;jci;? talumi;jci;&mrsm;u vn;aumi; awUjrieivm  
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ulausmi;om; Em;ausmi;om;wu uEm;ausmi;&i;vn;aumi;? a&vyom;wu  
avavm&i;vn;aumi;? v, , mvyom;wu v, , mpuysl;&i;vn;aumi;? &uue;&u  
owu t0wtxn&uvyji;vn;aumi;vn;aumi;? au;vu vyl? vrylwu  
vylvn&i;vn;aumi;? t<sup>1/2</sup>;coabmEi waysmwyg;oqlujci;jzpí <sup>1/2</sup>ijrL;lunE;z,  
aumi;vygon/ au;vuaw;uAsmrsm;ulum;&<sup>1/2</sup>jzi au;vuaejynow\ e, y, "av?  
vr"avEi trsl;oma& [eyewu ay:viapygon/ &ci<sup>1/2</sup>&mau;vuaw;uAsmrsm;wi

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rsm;jziom zUEo;Ee;xm;ygon/

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au;vuajynow\ &iwi;rayguzm;vmaom obm0aw;orm;om jzpluygon/  
xalumi pmwpapmiaywpzU pyqjci;rc&ontwu rnon acwwirnon pmq  
pyqcon[ ívn; ro½&ay/ acwtququvuqiur; umEwwut m\* aqmiciu  
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xm;? vr0e;uiwu &i;E;ulr;0icpm;rapygon/ xlyi &ciijn\ awmawmia&ajr  
obm0tvuvn; cpm;rapygon/ ai;rmjrermeii½ jrermmayoilum;&jci; &nre;  
cuizpon jrermPW"mw jrerm taw;tac:wu ojriap&Ei jrermawmawmi  
a&ajrobm0u cpciirwE;wwap&e &n½, on &nre;cuEi uunr jzpapygon/

t o;wp&m t ñmwpcyrmiyon jrermjynaxmipwi &ciwi;&i;om; jynow\  
"avx;wr;p0vmrsm;u tjcmaom wi;&i;om;jynorm;Ei jrermEii½rwi; aexilu  
aom jrermjynovxrm;u em;vno½um cplun&i;E;r½ap&e? Eiiut"u  
u, pm;iyon au;vuaejynow\ b0ujriwiay;&Ei ,cacwwi tm;en;  
aeon vu;vi, um; um [ r½aejci;u jyevnappay;&etvim ]&ciivr&Ei "av  
bmomaw;uAsmrsm;}} pmwr;u avvmwiy&jci;jzpygon/

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qíoyluon/ to, i, ioq&ojzi lum;em&o uav;i, rsm; tycipwu jzpay:ap  
on/ tjc; \tpüvn;aumi; tq;üvn;aumi; tptq; 2cv;üvn;aumi;  
]]Z;...a0...a0...Z;...Z;}} [ toxní q&aomallumi ]]Z;a0a0tjci;}} [rcirsm;u ac:a0:  
luonu avvmawU½&ygon/

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um;rsm;tjzp , i;½jci;? , ijci;? {jci;? { , ijci;? lo , i , ijci;? loav; , i , iponjzi  
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oq&aomallumi uav;acsmoci;r&[ qygon/ , i;wi qii v&aom ycu, i;Ei  
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avsmu? xywe;wüqí vaomtcg cnaEmixm;aomlu;u wwacsmi;qí  
vn;aumi;? vujiwe;ueívn;aumi; trsl;rl;vluigon/ p;v&aom'e; ,i;rm  
tr0i;opyi&yatmuü wyqixm;luon/ p ,i;rm opw;yi;u;u avuo  
cuaeatmi xi;xívn;aumi;? opom;y0aumaumjzi vn;aumi;íyvylyigon/  
p ,i;u t½ ,ra&mao;aom re;uav;rm;? uav;xe;ty&aom re;uav;rm;on  
,i;csi;rm;u oyioqí twwtm; ,um ajcziueausm uí p;v&on/ au;vu½  
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jrerpum;wi o;paeom ,r;? ,r;t uponwon &ci ,i? ,r;? ,i? ,i;  
pum;v;rm;Ei wprsl;wn; jzp[ewygon/ { ,i{ci;[aom pum;wlonvn;  
{irpmvy&m;on teut"yg ,jzpygon/ xltw { ,i? {ci;? { ,ici;wwivn;  
uav;i , tyay;map&e {irpm vycgici;teujzpygon/

ycujzi uav;u acsmoyci;talumi;u pmwpapmiaywpzljzi \*E0iajrmu  
pmayxwi awl&onrm &ciri;or;{ci;jzpygon/ "{ci;"qonrm b&iom;awm  
or;awmrsm; Zmwao;Zmwrnewu uap&e rsl;½;p0qu be;wec;awm uycyu zlq  
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jrerm{ci;wi ycuwi; uav;b0pyqon u {ci;[ac:qly; em;vn oww  
ont½ ,wi pyqon{ci;u em;awmo i;{ci;[ cjc;owrwxm;ygon/

&ciau;vu"avbmom aw;uAsmwi vn; ,i;csi;on wprx;jcm;on  
aw;uAsmwprsl;[qEiygon/ ,i;csi;wi rci u uav;i ,acmoyaom ,i;ci;Ei  
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av;v;wpyg'cn;r[wlyyg/ o;v;py? av;v;py? ig;v;py? ajcmu v;py? &p v;pyrm;  
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o&mwī teut"yg, jynply; qv<uū xi&ay:viapygon/ lūm;&o  
rsm;t; toom, mrEitw lūnE;at;cr;arUavsmapygon/

&ciau;vūwī acwpm;caom om;acsmycuvoci;rs;teu ]rñppcs ycu v}}  
oci;u avvmwijyygrn/ &ciau;vua'o on jrermāus;vua'oEi rjcm;v?  
awmiajajryeEi ule;twi;yi;r au;awmoaus;awm om;t;v;on v, , mui;ule;  
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&ciyne, on a&;tcguwn;u ppa&;upay:ayguontcg t ½, a&m u o  
a, m u sm;t;v; pprxr;lū&on/

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jynrEi &ciajru yi;jcm;um&xmonwwi;βu;oz, vn; jzpvmon/ a&;&cirsm;um;  
jrermjynru ta&ljin jrermwū ta&l om;rs; [ ac:qclū [e wygon/ ta&lEi  
ppjzpontcg &ciwon taemu ½;ru ausmvm;cwuvmum ppqilu&avon/

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vyaqmi&on/ trrupwzu? v, , mvyie;wzuji uav;uxe; tiww  
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ycua, rm? tyrr;uav;

om;va, ? p...a0...a0

pa0...a0...p...p/<sup>1</sup>

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<sup>1</sup> ri;Ei? 0? &ciaw;o? 4/

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a&zUxm;yg on/ uAsm talumi;wi;wi alumi;a& (4)tq;rvvli talumi; tm;v;u  
um&eto;iyí a&zUxm;alumi; awU&ygon/**

**uAsmww, talumi;u ]]ysm}} owr pmalumi;tq;u ]]v}}? 'ór pmalumi;  
tq;u ]]p}} [aom um&ersm;jzi to;csxm;alumi;awU&ygon/ wi;uyao m av;v; py  
pn;ur;rsl;r[waomvn; uAsma&zUxm;yrmajjyply; &cibm om "avto? [e?  
w&, mwEi wzuoqvu ygvli o, memaysmz, ½vonuAsm [q&rnjzpygon/**

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**r&ici**

**Z;a0...a0**

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**t;a, mioyaw**

**Z;a0a0...a0...Z; ...a0...a0**

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**Z;a0a0...Z; ...Z;<sup>1</sup>**

**cuqp**

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**t;a, mi = tar**

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&icirmyyuayly; oci;qoyyu azmjyxm;yg on/ uav;on i, ½, ve;vly;  
tr&icitz&iciwiwií oci;qacsmoy&rn t½, wi oq&aomaw;uAsm jzpy&  
yg on/ ]]t;a, mi oyaw}} [aompum;r ]]ta, mi}} [qaom a0g [m&rm &ciy ne,**

<sup>1</sup> rrizl? a': (oqjyo)? r&ici

&r;|Aa'oawm "av t& ]]tar}} jzply; ]]Z;a0a0}} qonrm jrermrcirsm; oqav<sup>1</sup>/<sub>2</sub>on  
]]t at; at; t}} [aom tou zv , , um oqx<sup>m</sup>;jci;jzpon/

uav;on &ciyne , wiar;zm;ly; uav; \uUcioepr;ru ]]o}}Ei Ei; , 0  
jyx<sup>m</sup>;ygon/ &cijynwi a&;b&irsm;vuxuu "m;vvueursm; vyui&mwi  
o&nuslon ozi<sup>u</sup>;rsm;<sup>1</sup>/<sub>2</sub>calumi; o<sup>1</sup>/<sub>2</sub>&ygon/

ycuwi;yi ra&muao;on ypau;uav;i , twu rb \arlmvicurm  
owom;0;&wemav;on tz&cijyntus<sup>u</sup>;u oacs<sup>mi</sup>;uol bulcipm<sup>pr</sup>;aqmiei  
rn[ar<sup>m</sup>vialumi; Oyrmtvu<sup>m</sup>jzi weqm<sup>qia</sup>&zlx<sup>m</sup>;onrm lunE;Epouz ,  
aumi;vygon/

"avbmomaw;uAsmwi , i;ci;rs<sup>m</sup>;u omci;zUqen;jzi zUqx<sup>m</sup>;ygon/  
 , i;ci;rs<sup>m</sup>;teu t"yg , ay:viam v , v , uuoa<sup>b</sup>mayguEioab<sup>m</sup> pum;v;  
rsm;ua<sup>1</sup>/<sub>2</sub>;cs , í om , mcs<sup>r</sup>;ajrU<sup>pm</sup> em;qíEi&e vwvyaygyg;pm a&;zUav<sup>1</sup>/<sub>2</sub>allumi; awU<sup>Ei</sup>  
ygon/ , i;cs<sup>i</sup>;rsm;rm e , ajra'otvu<sup>u</sup>jym;r<sup>1</sup>/<sub>2</sub>aomvn; <sup>1</sup>/<sub>2</sub>wqy<sup>1</sup>/<sub>2</sub>wq en;rmwn  
luygon/

&ciaw;owi t&ipuEu]]ppwaumi;a'oü &circiwon , i;p;vsu  
uav;u , pcs<sup>um</sup>vn;aumi;? uav;tci;ci;vn;aumi;? , i;om;ci;rs<sup>m</sup>;u oqav<sup>1</sup>/<sub>2</sub>  
luon}} [qygon/ , i;ci;rs<sup>m</sup>;on yw0e;ui<sup>1</sup>/<sub>2</sub> talumi;t&mrs<sup>l</sup>;pu tajccvu  
zUqwwluygon/

t b<sup>m</sup>u;0g

t b<sup>m</sup>0g

t b<sup>m</sup>qcw? v<sup>m</sup>;c , i/

tri0g

triqajymi; v<sup>m</sup>;c , i

q0g-

qpyg; ax<sup>mi</sup>;v , i/

pyg;0g

pyg;luuacs<sup>pm</sup>;v , i/

luuacs<sup>0g</sup>

luuacs<sup>pe</sup>&? x;v , i/

pe&0g

pe&- opacgi; 0iv , i/

opacgi;0g



opacgi;-r;wuypv , i/  
 r;0g  
 r;&qw? yp v , i/  
 &0g  
 &qiaAgib;u;? aomuv , i/  
 qiaAgib;u;0g  
 qiaAgib;u;awmip0? a , miv , i/  
 awmip00g  
 awmip0eEi; pu v , i/  
 eEi;0g  
 eEi;-oue; q;v , i/  
 oiue; - 0g-  
 oue; armi&i 0wv , i/  
 armi&i - 0g-  
 armi&i ye;qwvm;c , i/  
 ye;0g  
 ye;b&m; wiv , i/  
 b&m;0g  
 b&m;eAme? u;v , iav;? u;v , i/<sup>1</sup>

cuqp

t b m 0 g                      =        t r i 0 g                      =        t a z a u m   t a r a u m   b , o m ; v ?  
 b m v y v /

qiaAgub;u;                      =        qiajymib;u;

0iv , i                              =        0io m ; a v & /

armi&i                             =        u & i

a , miv , i                        =        o m ; v m v n y w a e a v & /

p u A s m a v ; r m   e m ; v n o w w v U b 0 u   p ; p r ; w w o n t ½ , w i   v b u ; r s m ; u  
 u a v ; i , u   o o c i o n t & m r s m ; u   w p c l y ; w p c   a r ; j r e ; a v [ e j z i   a & ; z U x m ; y g o n /  
 y x r 0 ; p m   t a z b , o m ; v [   a r ; o n u   t a z q i y v y & e   a w m x o p c w u m   q v y & e  
 o m ; o n /   t a r u x q u   t r o a j y m i ; & e   v u o m ; o n /   " q "   q o n r m   p u m ; v ;

<sup>1</sup> ri;Ei? 0;? &ciaw;o? 74/

&aom t c g q u b m v y o v [ a r ; o n / q u p y g ; a x m i ; & w m ? p y g ; u a r ; j y e y g o n /  
 p y g ; o n l u u u a v ; p m ; a l u m i ; l u u a c s ( o ) l u u u a v ; u p e & u o w o m ; a l u m i ; ?  
 p e & u o p a c g i ; 0 i p 0 o p a c g i ; u r ; w u a l u m i ; r ; u a & E i l i r ; & o n / x t c g a & u a r ; j y e  
 y g o n / a & u q i a y g u u ; u a o m u a l u m i ; ? q i a y g u u ; o n a w m i p 0 a w m x y u  
 o m ; w w a l u m i ; ? a w m i p 0 q o n r m e E i ; p u & a l u m i ; ? e E i ; r m o u e ; q ; & a l u m i ; ?  
 o u e ; u a r m i & i u & i u 0 w & a l u m i ; ? u & i u b & m ; y e ; w i & e y e ; c ; z o m ; a l u m i ; ? y e ; u  
 b & m ; y a z m & a l u m i ; ? b & m ; u e A m e o l u ; 0 i a l u m i ; E i u a v ; u o e m ; v n a t m i w p q i c i ;  
 j r i a t m i a j m j y x m ; y g o n / t a y g i ; a z m r s m ; E i a y s m 1 / 2 i p m o q & u m o w & o a y : v i l y ;  
 u a v ; i , r s m ; , i ; v u p m ; & i ; o i y i o q c l u y g v r r n / u a v ; o b m 0 p ; p r ; w w a o m  
 t a l u m i ; t & m r s m ; r 1 / 2 ; z v m , l u n u ; u , r r s m ; p o n t a l u m i ; j c i ; & m r s l ; p y g 0 i w w l u  
 y g o n /

x l j y i & c i a w ; o p m t y w i p m a y o a w o t & i p u E u & c i j y n ü a j r m u 0 ; a c w  
 o n & c i , 0 a u ; r e , y , t u s , j y e q ; E i & c i o b m 0 a w ; o c i ; w o p x e ; w ; w u q ;  
 j z p c \ / a j r m u 0 ; a c w a y : o i , w \ 1 / 2 w q c l u a o m e r w ? l w i ; ? w a b m i r s m ; o n y i  
 \* w E , a o m t z t E l q e o n u a w l & \ [ q c y g o n /

A ' \ w & m ; t q t E p o n r n o n t & m r q t a l u m i ; a l u m i t u s l ; j z p v m o n [ l  
 q & o n / x w & m ; a w m u a z m ñ e ; o n " a , " r m a [ w " y g a u s m u p m t w c u p m r s m ; o n  
 & c i j y n a e & m t E t i j m ; w i w ; a z m & 1 / 2 c z ; y g o n /

u e ; a b m i a c w a E m i ; o a y g r i ; y g a w m r p 0 u t w w w a b m i u o l x u a y : v m c a o m  
 ] i g 0 r ; y q m r a e o m } } q o n a w ; u A s m r s l ; & c i " a v a w ; u A s m w i v n ; a w l 1 / 2 & y g í a z m j y  
 v u y g o n / , i ; r m A ' \ w & m ; a w m v m b , t & m r q t a l u m i ; w & m ; a l u m i t u s l ; w & m ;  
 j z p v m o n u a z m ñ e ; x m ; j c i ; y i j z p y g o n /

ayg u y i a y g u y i 1 / 2 a y g u y i

ayg u y i u i ; v i ; ? c g ; p i ; p i ; r m

1 / 2 A s l i ; Z m j z p ? e m ; y g a &

i g ; a y : v l e m ; y g a &

i g ; u Z m j z p a y : y g a &

u l l r l v l a y : y g a &

u l u Z m j z p ? l l r l y g a &

i z w p a c s u u v l ? l l r l y g a &

i z w p a c s Z m j z p ? u u y g a &

r ; t v l ? u u y g a &

r ; u Z m j z p ? t ; y g a &

z g ; j r n v l t ; y g a &

zg;uZmjzp? jrnyga&  
 >ru|u|v|? jrnyga&  
 >r;uZmjzp? u|uyga&  
 0r;uZmjzp? u|uyga&  
 tpmrwau? u|uyga& av  
 u|uyga&/<sup>1</sup>

cuqp

u|rr|v| = u|araEm u|í (u|t|iv;í)

izwpacs = y;izwau mi uav;

r; t; v| = r; t í

>r = a|r

reeom = raeom

tpmrwau m = tpmq mav m i o j i

&ciyne, \ t"u t ouar;rvyie;rsm;rm v, |, mui;ule;0, smO|cajr  
 puy<;a&;? ig;zr;vyie;? &uue;vyie;? vurvyie;? t;vyie;? avvyie;pon  
 jzpal u mi;av v maw<sup>1/2</sup>&ygon/

&ciyne, \ puy<;a&;vyie;u yn m&i rsm;u

(1) v, |, mpuy<;a&;

(2) awmi, mpuy<;a&;

(3) 0, smOpuy<;a&;

(4) ui;puy<;a&;

[í t"uav;r<;c;yxm;on/ x<sup>1/2</sup>&mpuy<;a&;r pyg;? ajymi;? Er;? ajry? ytr<;r<;?  
 0g\*r; pon pm;o;ue? vo;ueypn;rsm; xuay:vmcon/

x|x u uer<;sm; twu pyg;pu&mwi u|ar;? Em;ar;? u|au sm i;? Em;au sm i;? jru&y?  
 v, xe? y<;Ew? aumupu? pyg;&y? pyg;e,? wvi;e,? qezy? armi;axmi;?  
 pyg;u w paom au<;v u<sup>1/2</sup>&m vyie;aq mi w m rsm;ay:aygu vm on/

y? ajymi;? Er;? ajry? 0g\*r;puy<;rrsm;rm 0gpu? 0gze? 0gii? jcnc? &uue;  
 &upon au<;v u<sup>1/2</sup>&m vyie;rsm; ay:aygu vmcon/ x<sup>1/2</sup>&m vyie;rsm;on v|ori;  
 \ w;wujzpay:vmrEi tw &ciynwi a&;Epaygi;rsm;pm uyi jzpw n vyaqm i v m c  
 on<sup>1/2</sup>&m vyie;rsm; t jz p, aewiyi&ywn wi u<;, v u<sup>1/2</sup>ae u on/

<sup>1</sup> ri;Ei? 0;? &ciaw;o (1965) 75/

&ci v r; w \ vyie; a q m i w m aw; u A s m r s m; w i v , , m u i; u l e; t w u  
v , o r m; E i t w v y a q m i o n E m; u a c s m o n u A s m u E p o u r y g o n / , i; u a t m u y g  
u A s m r s m; w i a w \ E i y g o n /

Em; ye; v r m

er i \* w ? e y s i l i \* c l e;

j r u w r; a u ; a r ? a ' a u m u e , u

e , u w a r a E m i; ... v m; ... v m; /

u , u v n; o e ? c w e t j r i

t r; a c s ? a c s m a c s m q i a u

e i 1/2 u v a & ? a ' a u m u e , v

e , u w a w a E m i; ? v m; a v E m; 1/2 u v m; ... v m; /

e z m; e u; c i i ? i g v u u i

p i i y i p w e; ? v r m v u a w

E m; & y e; ? q r; y e; a u ; a r

a ' a u m u e , u n u a t m i e , y g /

b m; y g; a v b m; y g; v m; ... v m; ...

c u p p

er i \* w = O; c s \ w w 1/2 a o m E m; r

e y s i l i \* c l e; = O; c s \ c l e; c l e; 1/2 a o m E m; a y g u

a ' a u m u e , = p a u m u r s m; u

c w e t j r i = a j c w e j r i j r i

t r; = t a r;

e z m; e u; c i i = e z m; e u; c i n

a u m u = p y g;

p u A s m w i t r a r; c i; E m; E i E m; & i w \ \ u i e m a o m q u q a & u x i [ y a z m j y  
x m; o n u a w \ j r i & y g o n / a & & c i w o n u r s m; E m; r s m; u o w j z w p m; a o m u o n " a v  
p 1/2 u r s; r 1/2 u a y / o w t m; t o u o c i a u s; Z; & i t j z p a r w m x m; u m , , p m q u q  
a v 1/2 w w \ u o n / o w E i y; w i v y u i p m; a o m u r t w u v n; o w u a y s m 1/2 i a p & e  
e m; 0 i c s \ o m p m a j y m q a p c i; w w o n u p u A s m w i a w \ j r i & y g o n /

u A s m w i E m; & i u o U E m; u w , w , a c s m c i; a e y g o n / o u o U E m; E p a u m i u O; c s \  
w a o m E m; r u; ? O; c s \ c l e a o m E m; y s \ u; [ i t m v y p u m; z i p w i a c: q E w q u x m; o n /  
o n a u m u p y g; u a u m i; a u m i; p y g; e , a y; v u p r; y g / o n t a r u o m; w o r; w u

jru&wjru xr;au;cygon/ om;wor;wuvn; pyg;uau mi;aumi;e , ww luw ,  
 r[wygv m;/ eiwEpaumi v;u u , xnuvn; oermly; ajcw(cwe)u vn;jrilu  
 w,/ tar;awu vn; acsmvuvvu uwm pmzuvawmiq; r , rxiawmb;/ eiw  
 Ep0;pv;u pyg;e , w , aumi;luw , / ]]vmlupr;yg u , }} [ í acsmac:ae [ e a&;zUxm;  
 onrm Epoup&maumi;vygon/

eiw&U ezm;lu;u igwpa , muwn; (niompm)uiw , ly; piyipwe;um  
 a&laemutwi; om;aevuwm w , vn;vrmluygv m;? eiwEpaumi v;on tar  
 twu ye;uoljrwE;cpciz , aumi;vwon;vr m? or;vr mawygyavu , / on  
 aumue , v&wpyg;e tarqr;ye;au; &Ú; r , u , / 'galumiom;wor;w uov  
 &atminunuuav; e , ay;vuuygu , [ í rbu om;or;rm;u talumi;tus;  
 ñeum avajyat;av;jzi oeo iq;rci;ae yrm cr;ajrUunE;apygon/

puAsmwi o'gvum& um&etoyi;weqm qiyaumi;vly;

"ezm;èu;cñi? igvuui

piyipwe;? vrmvuaw

Em;&ye;"

[um&etonñwpm a&;zUxm;yg on/ ]]Em;&ye;}} [aom ormoemrtzUrmvn;  
 &&ium tvay:ur;uiv rmaomye;uol jrwE;Epoup&maumi;on Em; [t"ym ,  
 &ly;? ½yutvum? 0u0wtvumajrmupm a&;zUEipr;½allumi; avvmawU½&yg on/  
 puAsmon Em;acsmaw;jzpaomvn; o'gvum& twmvum&Epyg;pv; jyn0pvily;  
 uAsm\*Pajrmuum &ouxrpm azmu;Eiaom uAsmaumi;wpy' t jzpawU&yg on/  
 , i;rm v , orm;uovy&rn tvay:wi xm;onapwem arwmu yxrxm;Ei í  
 puAsmon jynpvavmu aumi;realumi; awUEiygon/

xlyi ]]v , vyaumi;}} uAsmwivn; wvi;e , ay;on Em;rtm;acsmarmum  
 ci;apaom Em;acsmwvi;e , tjci;(ci;jwpy'jzpygon/

v , vyaumi;

Em;ra , ½wy? yiv , em;rm

om;wp½? \*wy\*waygi;

v , vyaumi;? jruaumi;y;ar

a'wpe , u? nuatmiv , yg

vm;vivm;vi? vm;viEm;½U

bm;yg; - vn.. vn...<sup>1</sup>

cupp

wpe , = wpvi;jyiwi wpcge , pmcsxm;aom aumupyg;/

<sup>1</sup> uebe? q&mawm (oqjyo)

**b<sub>m</sub>;y<sub>g</sub>** = **Em;uauU&ejymaompum;? a0g [ m&**

**om;w<sup>1/2</sup>** = **wp<sup>1/2</sup> , wn;<sup>1/2</sup>aom om;wpty**

**\*wy** = **Em; \ \*wwi t om;rmwuaeoji yyjiyi jriji&aom \*wom; t rm**

**v<sub>m</sub>;v<sub>i</sub>** = **om;y<sub>g</sub>av (v<sub>i</sub> = v = av)**

**p uAsmwi wv i;e , ay;&on Em;rmEm;rjzpon/ Em;rrm<sub>v</sub>n; v , , m**  
**vyom;aumi;tjzp v , vya&o<sub>ji</sub> Em;r \ \*wy;rm t om;rm<sub>y</sub>ijzpaey? Em;&iu**  
**pa<sup>1/2</sup>u pr<sub>i</sub> tyiye;cvyay;aeon Em;u jruaumi;aumi;ay;ciygon/ wv i;yi wi**  
**wpe , pmcay;x<sub>m</sub>;on aumupyg;u nuatmi e , ay;pr;y<sub>g</sub> [ í acsmarmajym q [ eu**  
**a&;z<sub>u</sub>x<sub>m</sub>;jci;jzpygon/**

**p uAsm u qjyorm uebeq&mawmjzpygon/ q&mawmrsm;on v , vy ie;0i**  
**Em;rsm;u ñmwmoem;pw0iluon/ vwtwu touao;alum jzpaom 0r;pm<sub>y</sub>g;**  
**&may;aelluon Em;rsm;tay: oem;\*<sup>1/2</sup>Pm<sub>x</sub>m;lluy? pw0ipm;lluyu puAsmrsm;u azmjy**  
**aeygon/**

### **lcio;oycu**

**vr<sub>sk</sub>;wi; oqr<sup>1/2</sup>uonen;w w;rwr\*ww&,mon vr<sub>sk</sub>;wi;\ obm0**  
**om , mrr<sub>sk</sub>;u jzapEiayon/ vr<sub>sk</sub>;wpr<sub>sk</sub>;\ b0touao;a<sub>u</sub>;oz , vn; ta&βu;**  
**vygon/ a&mrjyn&i e\*<sup>1/2</sup>;b&i t<sub>m</sub>; o \ txe;awm yw<sup>1/2</sup>; , wpu tEynmu**  
**rz<sub>u</sub>q;y<sub>g</sub>Ei [ aocge;wi pma&rm<sub>l</sub>um;calumi;u Am; 'wZmwum;ü lun<sup>1/2</sup>v<sub>u</sub> &on**  
**[ &cipmayoawot&i puEuqygon/**

**&ci vr<sub>sk</sub>;Ei"avbmom aw;uAsmrsm;r jynaxmipjrermEi i twi rwi; aexilu**  
**aom wi;&i;om;vr<sub>sk</sub>;rsm;teu &ci vr<sub>sk</sub>;talumi;Ei csp&bmom"av aw;uAsmrsm;u**  
**em;vno<sup>1/2</sup>ci&ygon/**

**&ci"avbmom aw;uAsmwpr<sub>sk</sub>;jzpon , i;ci;wi uav;acsm , i;ci;Ei**  
**upm;<sup>1/2</sup> , uav;i , rsm; u , wioqaom , i;ci; [ í Epr<sub>sk</sub>;Eppm;<sup>1/2</sup>aejci;u tjcm;**  
**wi;&i;om;uav;acsm uAsmrsm;Eirwon x;jcm;cuyijzpon/ puo , i;ci;rsm;Ei**  
**&i;E;ci&aom uav;i , rsm;on tu<sub>sk</sub>;talumi; qijcio;oywwon trm;re**  
**cjcm;Eirn v<sub>u</sub><sup>1/2</sup>&nEv;&njyn0aom ynwwwvawm vaumi;av;rsm; jzpatmi**  
**tEynmjzi pn;<sup>1/2</sup>;v<sub>l</sub>aqmay;aom aw;uAsmrsm;yijzpon [ xijrirygon/**

**q&mwuovbe;Ei \ ]]oi , ci;vbquí ac:rnci}} 0w<sub>w</sub>ic;pjci; arwm**  
**Eiowrm cjcm;í r&alum i;? cspjci;arwm on uav;b0wi tx;v tyalum i;? uav;**  
**Ei pwynmpm tyg talumi; tcsu u Zmwaqmi \ ajympum;rsm;jzixnoi; a&;om;x<sub>m</sub>;**  
**onu avvmrwom;z;ygon/**

,cacwuorbu vn; r;vi;rr;cyt vyvy& om;or;rm;Ei aE;ax;  
vuvrr<sup>1/2</sup>? om;or;rm;uvn; ausmi;wu&? oiwe;wu& aeueaer;em; &onr<sup>1/2</sup>?  
tEynmEi pn;<sup>1/2</sup>;vraqmay;&ermvn; u, xi&mu, pi;tEynmrsm;Ei t vr;a0;ae  
onu awl&ygon/

&ciaus;vu"av b m o m a w; u A s m r s m; r v y i e; a q m i w m y g E m; a c s m a w; u A s m  
r s m; w i & c i a u s; v u a e a w m o a w m i o m; w \ p w a e p w x m; p<sup>1/2</sup> u o b m 0 r s m; u t w i;  
u s s a v v m o j r i & y g o n /

a&&ciaus;vuom;won A'bmom \ tq;trjzpon r\*i(8)yg;r orm t mZ0  
upmjzi <sup>1/2</sup>;om;ajzm irwreueon t vytuitiytrw<sup>1/2</sup>uyrm tw,z, aumi;v  
on [ xijrirygon/

&ciaus;vuom;won v, , mui;ule; 0, smOlcajrpuy; r v y i e; r s m; u  
t r s m; q; t r y a e l u o r s m; j z p o n t a v s m u u l E m; w t a y: w i ñ m w a x m u x m; y? o w  
E i t w <sup>1/2</sup>e; u e a q m i <sup>1/2</sup> u l u & m w i r o m; p y r m a j m q q u q c i; a p w w y w i r m , O a u s;  
o n E i i u; o m; w \ a u m i; j r w a o m t y t r r s m; j z p o n [ q c i y g o n /

&ciom;won rrwpm;0waertwu <sup>1/2</sup>&m"avtwi; yiye;βu;pmvyui  
t ouar;&aomvn; &wemo;yg;u ui;<sup>1/2</sup>i;r? uov'geiya&u tx0goem ygr<sup>1/2</sup>ly;  
vuawtm;zi vn; vyaqmiwrrpon pwaumi;pwjrw<sup>1/2</sup>uyyu p u A s m r s m; u  
a x m u q u m a u m i; p m o j r i E i y g o n /

e\*;

jynaxmipzm; &ci vr;Ei"avb m o m a w; u A s m r s m; u a z m x w a v v m w i j y c i;  
j z i , c j y n a x m i p j r e r m E i i u w n a q m u a e o n z, '&, j y n a x m i p o l c w u  
a v l m u v r; & m w i a t; c s r; o m, m í a c w r z U z; w; w u a o m z, '&, j y n a x m i p j z p a &;  
t w u v t y a o m p w y i; q i & m i y j y i a j y m i; v r r s m; t w u t a x m u t y j z p a p & e  
v n; a u m i;? w i; j y n u w; w u a c w r a p c i l l u o n a e m i v m a e m i o m; w \ v u <sup>1/2</sup>& n  
E v; & n j y n 0 a p a &; t w u a o m v n; a u m i; t a x m u t u i y E i r n [ , l l u n a r l m v i r y g  
o n /

u;r;u;pm&i;

urm&? &i/ (1990)/ t v u mye;u;/ pwwt!ur/ wiwiat;/ y#uwpmay/

puE? &i/ (1999)/ &ci o b m0aw;uA;mrsm;? &eue? u v sm? yEywu/

xev i/ (2003)/ yi; , acw t i;0acwjrermpmayrsm;? &eue? pmayArme/

xe;a½? 0;/ (1995)/ uAmp , pu;r;? &eue? ynm t v i;jyyEywu/

azarmiwi? Ú;/ (1320)/ jrerm payori;? yÍrt!ur? &eue? o"r0wyEywu/

ri;Ei? 0;/ (1966)/ au;v uawm½maw;uA;sm? &&ipmaywu? rEav;/

wu o v jrerm t b"me/ (1963)/ t p;&yEywuEi pma&u& , mXme? &eueirU/

jrerm pmñeaygi;u;r;/ (1999)/ yxrw? &eue? pmayArme/

jrerm q½;pum;/ (1996)/ &eue? jrerm pm t z!O;p;Xme/

jrerm t b"ge/ (1991)/ &eue? jrerm pm t z!O;p;Xme/

&ci½;&m , 0au;rrsm; ( t rw 5)/ (1996)/

aem u q uw

o q j y o r s m ;

uebi i q&mawm? &r;!Air!e , /

a':vjr wÚ;? uaum½m? &r;!Air!e , /

a':rrjzL? ½myv½m? &r;!Air!e , /