

ARTS2511

⇒hYfa YX]UhY'; Yfa Ub'6

HYfa 'H\fYY''##'&\$%-

7ci fgY[·]Cj Yfj]Yk

GHJZZ:7cbHJWh:8YHJ]`g`

'7cbj Ybcfg'

B Ua Y	9a U]`	5j U]`UV]`]lm	@cWUh]cb	D\cbY
8 Y b]gY '< UbHY`	X"\UbhY`4 i bgk "YXi "Ui	,	A cfj Yb 6fck b &' (-',)*\$)-*

@YWhifYfg

B Ua Y	9a U]`	5j U]`UV]`] m	@cWJhjcb	D\cbY
8 Y b]gY '< UbHY`	X"\UbhY`4 i bgk "YXi "Ui	VmUddc]bha Ybh	A cfj Yb 6fck b	

7ci fgY 8YHJ] g

7 fYX]h'Dc]bhg'*

Gi a a UfmcZ'h\Y'7ci fgY

 $\label{eq:Giv_YWhi5fYU.9Wd_S`EfgV[We]} \text{GiVYWhi5fYU.9Wd_S`EfgV[We]}$

5ggYgga Ybh

5ggYgga Ybh'HUg_g

5ggYgga Ybh'hJg_	K Y][\h	8i Y'8UHY	Gh XYbh@YUfb]b[Ci hWca Ygʻ5ggYggYX
@jghYb]b['UbX'F YgdcbX]b['	%) ၊	&, #%\$#&\$% `%%\$\$`5A	%ž&ž(
Dcfhzc`]c'	(\$1	Dcfh7c`]c'='% #%\$žDcfh7c`]c'== &&#%%</td><td>%ž&Ž ž(ž)</td></tr><tr><td>HYgh</td><td>' \$1</td><td>%) #%#&\$% `\$%\$\$`DA</td><td>%<u>*</u>(</td></tr><tr><td></td><td></td><td></td><td></td></tr></tbody></table>	

GhUfhXUhY. Bch5dd`]WUV`Y

@Yb[h\.'*\$'a]bg

8 YHU]`g. 'H\Y'HYghk]``'VY'WcbXi WHX'j]U'H\Y'@A G']b'WUgg'fUddfcl "'*\$'a]bg\E''H\Y'HYghWcbg]ghg'cZ
Ui hca Uh]WU``ma Uf_YX'ei Ygh]cb'hmdYg'fY''["'a i 'h]d'Y'W\c]WYz'g\cfh'Ubgk Yfz'UbX'a UHW\]b[E'UbX']bX]j]Xi U``m
[fUXYX'ei Ygh]cb'hmdYg'fcdYb!YbXYXz'g\cfh'HYl hg\E'': YYXVUW_j]U'Ui hca Uh]WWcffYWh]cb'Ug'k Y```Ug']bX]j]Xi U`
Wca a Ybhg'UbX'gUa d'Y'Ubgk Yfg"

Hi fb]hb gYhb[. H\]g]g bchU Hi fb]hb Ugg][ba Ybh

5ggYgga Ybh(GdYU_]b[HUg_

GhUfhXUhY. Bch5dd`]WUV`Y

@Yb[h\. '%\$!%) a]bg

 $8 YHU]^g. Gh XYbhg WcbXi WhUg\cfhX]U^c[i Yf]!, a]bg&]b'dU]fg'cf'ga U^[fci dg'': YYXVUW_j]]U'a Uf_]b[fi Vf]Wfa Uf_YX']bX]j]Xi U^Mca a Ybhg''$

Hi fb]hb gYhb[. H\]g]g bchU Hi fb]hb Ugg][ba Ybh

5 http://bxubww.F.Yei]fYa Ybhg

 $5 \text{ thY b X Ub WY `cZ@YWhi fYg#Hi hcf]U`g`]g`a Ub X Uhcfm]b`h\]g`Wci fgY"`I bYI WY gYX`UVgYbWY`Zfca `a cfY`h\Ub`&$i cZ@YWhi fYg#Hi hcf]U`g`k]```fYgi `h']b`h\Y`Uk UfX`U`ZU]``[fUXY"`+b`@YWhi fY#Hi hcf]U`g`mci `k]```UWh]j Y`mYb[U[Yk]h\`WcfY`Wci fgY`WcbhYbhz`YbUV`]b[`mci `hc`UhhU]b`7@C`&\'' "$

7ci fgY'GWXYXi `Y

J]Yk 'WUqq'Ha YHJV'Y

H]a YHJV`Y

8UhY	HmdY	7 cbhYbh	
K YY_'%'%'GYdhYa VYf'! &\$'GYdhYa VYf	Hcd]W	? Ud]hY``*`"6YfiZgV]`XYf". 'dfcZYgg]cbg	
		5 i ZhU_h'/ ʿA c Xi ``%	
		D`YUgY'bchY.'bc'hi hcf]U``]b'k YY_'%	
K YY_'&.'&' 'GYdhYa VYf'! &+'GYdhYa VYf	Hcd]W	? Ud]hY``*`"6YfiZgV]`XYf".`dfcZYgg]cbg	
		A cXi ``&! (
K YY_" ." \$"GYdhYa VYf"! ("C WcVYf	Hcd]W	? Ud]hY` `+'": Øf`]a a Yf`i bX`Yk][".``]ZYghm`Y`UbX`ZJa]`m a cXY`gž``cj Y`UbX`fca UbWY	
		5 i Zhu_hž'A cXi ``%/ `&	
K YY_'(.'+'CWvcVYf'!'\% CWvcVYf	Hcd]W	? Ud]hY``+'": Øf`]a a Yf'i bX'Yk][".``]ZYghm`Y'UbX'ZJa]`m a cXY`gž`cjY'UbX'fcaUbWY	
		A cXi `'	
		bc``YWifY'fdiV']W\c`]XUmŁ	
K YY_`).'%('CWfcVYf'!'% CWfcVYf	Hcd]W	? Ud]hY` `+'": Øf`]a a Yf'i bX'Yk][".``]ZYghm`Y'UbX'ZJa]`m a cXY`gž`cjY'UbX'fca UbW	
		A cXi ``(
		DcfhZc`]c'=XiY.'% #%\$	
K YY_'*.'&%'CWvcVYf'!'&) CWvcVYf	Hcd]W	? Ud]hY`, '"? Ui ZYbž_Ui ZYbž_Ui ZYb". dfcXi Wgž Wcbgi a dh]cbža U_]b['WU]a gž'UXj Yfh]gYa Ybhg'	
		5 i ZhU_hž'A cXi ``%'/ `&	
K YY_`+.`&, 'C WcVYf'!'% Bcj Ya VYf	Hcd]W	? Ud]hY`', '"? Ui ZYbž'_Ui ZYbž'_Ui ZYb". 'dfcXi Wgž Wcbgi a dh]cbž'a U_]b['WU]a gž'UXj Yfh]gYa Ybhg'	

		A cXi `'
K YY_', . '('Bcj Ya VYf'!', Bcj Ya VYf	Hcd]W	? Ud]hY``- '"9bX`]WX`I fUi V". 'hfUj Y` 5i ZhU_hž'A cXi `'%!''
K YY_'''‱'Bcj Ya VYf'! %) 'Bcj Ya VYf	Hcd]W	? Ud]hY``- `"9bX`]W\`I fUi V". 'hfUj Y` A cXi ``(
		? Ud]hY``%\$'"BUhØf]W\`BUh f". 'Ybj]fcba YbhU``]ggi Ygž Ub]a U`g 5 i ZhJ_hž'A cXi ``% HYgh'%) #%%
K YY_'%\$.'% 'Bcj Ya VYf'! &&'Bcj Ya VYf	Hcd]W	? Ud]hY`%\$`"BUhØf]W\BUh f". Ybj]fcba YbhU`]ggi Ygž Ub]a U`g A cXi``&!(DcfhZc`]c`=Xi Y.`&&#%</td></tr><tr><td>K YY_'‱'&) 'Bcj Ya VYf'! &- 'Bcj Ya VYf</td><td>Hcd]W</td><td>GdYU_]b['HYgh '&) #/%</td></tr></tbody></table>

FYgci fWyg

DfYgWf]VYX F Ygci fWYg

3ebW] fW` Wg 4#b'ge >WZdŽg` V 3dTW[feTgUZ FW]^\$ _ [f 56 ff66B - +, !' ! \%!*\$) \$\%!+\!

FYWca a YbXYX FYgci fW/g

FYWca a YbXYX FYgci fWyg

6cc_-3ebW]fW^ Wq 4#b/qe 9 dS__Sf[] ff&6B.-+,!'!\&!*\$) \$' &!*L

6cc_-3ebW]fW`Wg 4#b'ge; fW'e[hfc5['Wdff66B.-+,!'!%&!*\$)\$&&!+L

 $\label{eq:localization} $$Mci 'a UmZbX'UXX]h]cbU``hYI hg`cb'; Yfa Ub`[fUa a Uf`i gYZ``"H\Y'Zc``ck]b['UfY'Uj U]`UV`Y'Uh'h\Y'I BGK @]VfUfm$

FY]a Ubbž'A cb]_Už'7eeW' f[S^9 Wd_ S` 9 dS_ _ Sd flega Ub]b[. '<i YVYfž'&\$%(Ł

GdYVXhž: fUbn'Yh'U'"žGVXf]hY', Vi b[g[fUa a Uh]_fl\u00e4ga Ub]b[.'<i YVYfž'&\$\%\$L

5`ZfYX'9Xk UfX'<Ua a Yfž: S__ Wde 9 Wd_ S` 9 dS__ SdS` V GeSYWž'&bX'YX"'f@cbXcb.'9"'5fbc`Xž'% - %Ł

5gdY_hY 6%Ž Cb`]bY YI YfW]gYg UbX UXX]h]cbU`a UhYf]U``

•

7 ci fgY '9j U'i Uh]cb 'UbX '8 Yj Y`cda Ybh

7 ci fgYgʻUfYʻdYf]cX]WU``mfYj]Yk YX`UbXʻghi XYbhg'ʻZYYXVUW_`]gʻi gYX`hcʻ]a dfcj Y`h\Ya "`

: YYXVUW_`]g`[Uh\YfYX`Zfca `ghi XYbhg`i g]b[`a m9I dYf]YbWY"`Ghi XYbhg`UfY`YbWci fU[YX`hc`Wca d`YhY`h\Y]f gi fj Ymg`VmUWWgg]b[`h\Y`dYfgcbU`]gYX`k YV``]b_`j]U'h\Y`A ccX`Y`Wci fgY`g]hY

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Hi fb]h]b Gi Va]gg]cb

_Zmci YbWci bhYf'U'dfcV`Ya 'k \Yb'UhYa dhJb['hc'gi Va]hmci f'Ugg][ba Ybhh\fci [\ 'Hi fb]hJbž'd`YUgY
hY`Yd\cbY'9| hYfbU``Gi ddcfhcb'-',) '' ' ' %cf'Ya U]`'h\Ya 'cb'Y! hYfbU`hY`hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-') .\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUft'' =Zmci
UfY'i bUV`Y'hc'gi Va]hmci f'Ugg][ba YbhXi Y'hc'U'ZUi 'hk]h\'Hi fb]hJb'mci 'a Um'Udd'mZcf'Ub'Y! hYbg]cbžVi hmci
a i ghfYhU]b'mci f'hJW_Yhbi a VYf'Zfca '9! hYfbU``Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY`Yj UbhXcW a Ybhgt'hc
]bWi XY'Ug'Yj]XYbW'hc'gi ddcfhmci f'Y! hYbg]cb'Udd`]WUhJcb'' =Zmci 'Ya U]`'9! hYfbU``Gi ddcfhmci 'k]``

5 WUXYa | W < cbYghmUbX D`U[| Uf]ga

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i±iWUbihU_Yia Ubm Zcfa qžZfca iXYi]VYfUhYiW\YUh|b[ihciUVW]XYbhU`mWcdm]b[iZfca iUiqci fWYik]h\ci hiUW_bck iYX[Ya Ybh'i

IBGK '[fci dg'd'U[]Uf]ga ']bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

7 cdm]b[.'i g]b['h\Y'gUa Y'cf'j Yfmg]a]`Uf'k cfXg'hc'h\Y'cf][]bU`hYl h'cf']XYU'k]h\ci h'UW_bck `YX[]b['h\Y gci fW'cf'i g]b['ei chUh]cb'a Uf_g"'H\]g'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k \YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b['U'ZYk 'k cfXg'UbX'd\fUgYg'k \]'Y 'a cghmfYhJ]b]b['h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU'žUbX']bZcfa Uh]cb'k]h\ci hUW_bck `YX[Ya Ybh'H\]g'U`gc Udd`]Yg']b'dfYgYbhUh]cbg'k \YfY'gca YcbY'dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci hWfYX]hUbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b["

7 c``i g]cb. 'k cf_]b['k]th 'cth Yfg'Vi hidUgg]b['cZZth Y 'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'thc'Ubcth Yf'ghi XYbh'VYZcfY'th Y'Xi Y'XUHYZcf'Zcf'th Y'di fdcgY'cZth Ya

- i bXYfgfUbX mci f'f][\hg'UbX'fYgdcbg]V]`]hJYg'Ug'U'gh XYbhUhl BGK
- VY`Uk UfY`cZd`U[]Uf]ga ž`Wcdmf][\hzil BGK `Gh XYbh7cXY`cZ7cbXi WhUbX`5VWWdhUv`Y`I gY`cZ I BGK `=\forall H`F Ygci f\W\g`Dc`]\wh
- VY 'Uk UfY 'cZh\Y 'ghUbXUfXg 'cZVY\Uj]ci f'Yl dYWYX 'cZYj YfmcbY ']b 'h\Y 'l BGK 'Wca a i b]hm
- `cWUHY 'gYfj]WYg'UbX `]bZcfa UH]cb'UVci hI BGK 'UbX'I BGK '@]VfUfm

Gca Y'cZh\YgY'UfYUg'k]``VY'ZJa]`]Uf'hc'mci ž'ch\Yfg'k]``VY'bYk"'; U]b]b['U'gc`]X'i bXYfgHJbX]b['cZU``h\YfY`UhYX'UgdYWng'cZ9@+69'k]``\Y`d'mci 'a U_Y'h\Y'a cghicZmci f'ghi X]Yg'UhI BGK "'\\hd.##qi VYWfi |XYg"`]VfUfm'i bqk "YXi "Ui #\`]qY#JVci hY`]qY

5 WUXYa]W = DZcfa Uhjcb

: cf`YggYbhJU``gh XYbh]bZcfa UhJcb`fY`UhJb['hc.

fYei YghgʻZcfʻYl hYbg]cb/ `UhYʻgi Va]gg]cbgʻ[i]XY`]bYg/ fYj]Yk ʻcZa Uf_g/ I BGK ʻ< YUʻh\ 'UbXʻGUZYhmdc`]WJYg/