



Real-World Examples and Sociotechnical Integration: What's the Connection?

Jacqueline Erickson, Colorado School of Mines

Jacqueline Erickson is a fourth year undergraduate student at Colorado School of Mines pursuing a major in Electrical Engineering. After graduation in May 2020, she plans to work in electrical distribution design at an engineering firm.

Dr. Stephanie Claussen, Colorado School of Mines

Stephanie Claussen is a Teaching Professor with a joint appointment in the Engineering, Design, and Society Division and the Electrical Engineering Department at the Colorado School of Mines. She obtained her B.S. in Electrical Engineering from the Massachusetts Institute of Technology in 2005 and her M.S. and Ph.D. from Stanford University in 2008 and 2012, respectively. Her current engineering education research interests include engineering students' understanding of ethics and social responsibility, sociotechnical education, and assessment of engineering pedagogies.

Dr. Jon A. Leydens, Colorado School of Mines

Jon A. Leydens is Professor of Engineering Education Research in the Division of Humanities, Arts, and Social Sciences at the Colorado School of Mines, USA. Dr. Leydens' research and teaching interests are in engineering education, communication, and social justice. Dr. Leydens is author or co-author of 40 peer-reviewed papers, co-author of *Engineering and Sustainable Community Development* (Morgan and Claypool, 2010), and editor of *Sociotechnical Communication in Engineering* (Routledge, 2014). In 2016, Dr. Leydens won the Exemplar in Engineering Ethics Education Award from the National Academy of Engineering, along with CSM colleagues Juan C. Lucena and Kathryn Johnson, for a cross-disciplinary suite of courses that enact macroethics by making social justice visible in engineering education. In 2017, he and two co-authors won the Best Paper Award in the Minorities in Engineering Division at the American Society for Engineering Education annual conference. Dr. Leydens' recent research, with co-author Juan C. Lucena, focused on rendering visible the social justice dimensions inherent in three components of the engineering curriculum—in engineering sciences, engineering design, and humanities and social science courses; that work resulted in *Engineering Justice: Transforming Engineering Education and Practice* (Wiley-IEEE Press, 2018). His current research grant project explores how to foster and assess sociotechnical thinking in engineering science and design courses.

Dr. Kathryn Johnson, Colorado School of Mines

Kathryn Johnson is an Associate Professor at the Colorado School of Mines in the Department of Electrical Engineering and Computer Science and is Jointly Appointed at the National Renewable Energy Laboratory's National Wind Technology Center. In the fall 2011, she was a visiting researcher at Aalborg University in Denmark, where she collaborated on wind turbine control research and experienced Aalborg's Problem-Based Learning method. She has researched wind turbine control systems since 2002, with numerous projects related to reducing turbine loads and increasing energy capture. She has applied experiential learning techniques in several wind energy and control systems classes and began engineering education research related to social justice in control systems engineering in fall 2014.

Dr. Janet Y Tsai, University of Colorado Boulder

Janet Y. Tsai is a researcher and instructor in the College of Engineering and Applied Science at the University of Colorado Boulder. Her research focuses on ways to encourage more students, especially women and those from nontraditional demographic groups, to pursue interests in the field of engineering. Janet assists in recruitment and retention efforts locally, nationally, and internationally, hoping to broaden the image of engineering, science, and technology to include new forms of communication and problem solving for emerging grand challenges. A second vein of Janet's research seeks to identify the social and cultural impacts of technological choices made by engineers in the process of designing and creating new



devices and systems. Her work considers the intentional and unintentional consequences of durable structures, products, architectures, and standards in engineering education, to pinpoint areas for transformative change.

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>lUad`Yg ]b >b[ l b YfYb[U[Y ghiXYbhg* YhY\YFYWcU b dWgfYZ FUhY
Wci fUgY LUbhU <`UfUO N b Gj]Yfggg]chm gYh ci h hc dfYgYbh WcifgY Wcb
h\Uh ghiXYbhg kYfY ZUa ]` ]Uf k]h\ ]b H U d]f] WUjhy]fmbXgUnh\Ujh Yhg\Yr
a][\h \UjY \UX jYfm `]hh`Y dYfgcbU`XYj YfY c dYXWYmk d h\YfL\Y i
fYgYUfW\Yfg h\fc i[\ U GUh] cZUbXYLW ]YbgyU fW i b dU b U] Y b U S) >G@: @>
```

HbY cZ h\Y a c g h h)\UuUWhZ ig`g c> i gYX kUg hc]``i gh fUhY U l]U` ` Wc a d c g]hY aYaVYfg+ P\Yb hYUW\]b[h\]g h c d]W) ZUWi`hm UbX h

WcbWfYhY,ghYY` Wcadcg]hY Wc`iab+ GJ`ggcb dc]bhg \UjhYh\Uh a
jYfm `]hh`Y dYfgcbU` YldYf]YbWY k]h\ hWY`WaBglghYWK)c\g\YbX
igYX YUgfmXY WUV`Y \YUXdh\cbXYgaUggUfUh>Y h\Y VY\Uj]cf cZ Wcad
LhiXYbhg Wci`X YUg]`m fY`UhY hX WUgYgYK\hfyS WUWUWUUYZWèi]
XYj]WY `]_Y U gaUfh d\cbY) h\ig VY]b[U]U` `m `cUXYX+

GJ`ggcb f][cfci g`m UggYggYX]h\Y]fa WUWlggZcZbh hYfèa g\hc
aYUgify ibXYfghUbX]b() dc*ddeWqmfY Y h b cWUgà fYKhYbh]cb) UbX
Ub YbX Yfa gifjYm]b cfXYf hc aYUgi WYagUfXXbHfYgèhYgYghkYYf
gYaYghYfg cZ h\Y WcifyY kg]WbXXZj bck\]WV`XXX+>

GJ`ggcbvg kcf_ Zcg bXUX\UhYh[YYUhYigXhY]ha dUWhZccfaUghWY cb YlUag
k\Yb igYX Zcfk\WbWYXhYg\]ghZcfjWUX`WU`KYg[]b g U`gc g\ck h
`cbhYfa fYhYbh]cb cZ `YUfb]b[]WdfXjYX ZbYgUK\YhYdgWgXYbh`
dYfZcfaUbWY kUg hfUX]h]cbU` `m gUh]gZUWhcfm+ ?]bU` `m) g\Y f
aUhYf]U`]bWfYUgYX g`][\h`m Zcf aU`YhUgh]icXgWZg>Zc` `ck]b[h\
g][b]Z]WUbh`m Zcf ZYaU`Y ghiXYbhg+ L\g] WUWUWUfYg[h]g]UgUUhcd]a
\Ug VYYb WcffY`UhYX YZL\WUWmXYkhgW\gYbZhg fghYWWUhYUghMg]b
Yb[]bYYf]Z]Y\W\ ZU]`g hc fYhU]b ZYaU`Y ghiXYbhgRUSH h\Y gUa

;NA ~~MB-HKMH~~@ AS=ILHAN REOD NK?EKO A?DJE?=H EJOACM=OEKJ

=if]b[f gYUfW\ cZ h\Y kcf]hYfdZh:fbX)fUXYYUWX[MXaWUgY ghiXm
cb h\Y ig`KcdZ XfYU UadYYg`gWUW]chYW\b]WU`R0P0S0B[bfUh]Yc]bf /- .5
dUdYf) :bXfUXY UbxgWfc]aWY]aZ Zcfhg hc]bWcfdcfUhY gcW]U` X]aY
WcifyY) >b[]bYYf]b[~~EOCSM~~ \Ying hZc]WUgY]g'd]YWh]Z]WU Ugrg UWhh]j]fY]Ygb
h\Uh Yad\Ug]nY U gcW]chYW\b]WU` gmghYag ZfUaYkcf]b]UbX ghU_
XY[fYYg) U` ` h\fYY UWh]j]h]Yg]bW`iXX [fcid UWh]j]h]Yg) f
Zc` *cd eiYgh]cbg 'h\fc[i\ kcf_g\YYhg cf cb`]bY ei]nnYg(+ >
X]ZZYfYbh gcW]chYW\b]Z]WU]haUgY7d]YbXUWU]bX ZUfag8 UbX Y`YWhf
Uihebcacig jY\]W`MgY'ZQfgOgUbX gYWcbX kYfY ZcWigYX cb g]b[
h\Y h\]fX UWh]j]hm gdUbbYX hkc W`Ugg gYgg]cbg+

Bb RYhYUbc` UWhk]j]hX]Yg) ghiXYbhg aWfcYcYU]gV]UhbX]XYbjh]fZc]bYXbh
]adUWhg h\Ub gRWBU` :b]na dUWh]gU` fYZYfYbWYg kYRY2sASUfY UbX gi
' :bXfUXY UbX McWYgYX Nb]hYX GUMY]Zc]b]g]Zc]icghU]bUVH\]Wm]g
WcadcgYX cZ h\fYY X]aYbg]cbg7 gcW]U` 04WUccbi[a]Wh)\YubXXcYbjc]hf c
Yld`]W]h`m XYZ]bY k\Uh Wci bhg Ug U sgcW]g]Ub] UaXWUhb]h]YbUh
X]ZZYUfYb]h]h Zfca YWcbca]W UbX Ybj]fcbaYbhU` WghWXfWg+ M\]
]bW`iX]f]gk)\dW\ igY sUdW]iUvtfYUgU hYfa Zcf X]aYbg]cbg cZ Yb[
gc`j]b[gWU]bUdgW) Ybj]fcbaYbhU`) Yh\]RU(S;)YUUbXgM\YUZh\ UbX g
Z]bX]b[g Zfca h\Y Z]fgh hXfWXUgUgXWUWY]KYYghc ZcWig acgh
h\Y]f UbU`mg]g cb h\Y h\]fX UWh]j]hm cb >O,:Og) k\]W\ kUg
ghfi[[`YX hc]XYbh]Zm gcW]kUWh]ajMUWUg+]b h\Yg ZUW]h]h]hm) h\Yr
h\Uh ghiXYbhg X]XhXhYj(YXcYdYf'gi bK]YfghUbX]b[cZ k\Uh gcW]U`
acfY UkUfY cZfXgYWcbXW]UM\YaUWUhgfg XY*ZfKYYfgWUg]bX]b[Ug)

s]XYbh]Zm]b[UbX YghUV`]g\]b[]bX]fYWh WcbbYWh]cbg UbX Wc
ZZZYWhc`bY\Udg cZ YgWUbX`bYW\bc`c[]WU` Ufh]ZUWhg UbX h\]b_
WcbgYe iYbWYg cZ hYW\bc`c[m VYmcbX 0BcXdi-MH0Sj+ ldm]BbXcYZZ]W]Y
\ckYj HfUhhUfYY UWX]XYg]Mg]jXybWY YdZb]b[ghiXYbhgv ibXYfghU
gcW]chYW\b]WU` Wcad`Yl'bhath]bi gYb[h]\bY Yhf\]bf[X UbX Z]bU` cbY(

:bXfUXY UbX McaV`*dla vgc Zc`igKX Vch\ h\YaUh]W UbX cdYb WcX]b
kf]hhYb fYgdcBgYg>OZ,c:OWk]b fhm\XYXdKph\ U gdYW]Z]W Yad\Ug]g
ibXYfghUbX]b[h\Y]bg*hf g la Yb hUbhUbXWbcbghfiWhg ghiXYbhg igY
gcW]chYW\b]WU`Smng hUag\cf g bXYZ]bYb hU]g[U sbUffck j]Yk cZ \
\iaUbg]adUWh hYW\bc`c[m UbX \ck hYW\GchY[m\WUb: bXfUXY UbX
McaV`]hYga s]bghfiaYbhU` h\]b_]b[t]g gmbcbmacig k]h\ Ubch
]bghfiaYbhU\]Wga)ktY XYgWfh]MYXAME= =J@AMEANDeh?Ncb+UVcjY
BbghfiaYbhU Ugh[i]abYg]h[\Uh hYW\ZcfYd[m]bXg fYUZe NXWhg sZ]fgh
gcW]chYW\b]WU` h\]b_]b[)]b k\]W\ gcW]U` fY`Uh]cbg\]dg k]h
ZZZ]W]YbWm UbX dfcXiWh]j]hm ci hWcaYgci bX`m+UhlaXUYXbUgX Mc
fYZYfYgWc gYjYb Wcaacb h\YaYg k]h\ fY[UfX hc gcW]U`) dc`]h
giffci bX]b[Y`YWhf]W UbX>UUhadbYagc icZ\hY YgW`YXAXHEOT KB
3EBA! 2JBM=NOMP?OPEMANP.AAMEC2M LYmOZ#cibX h\Uh acg kZfY\YgY h
Xca]bUhYX Vm]bghfiaYbhU` h\]bk]g d h kYdW\Ug]bYXfYg h]bY`mYUX
UWh]j]h]Yg) cf `YWhifYg+ M\ig) ghiXYb hgg]akdYf]YZ[X]Uka]cbX]Y`igd ccbZ
\ck h\Y gcW]U` kcf`X kcf_g UbX \ckYW\Wcd0Vnd]W6Yb hYfUWhg k]
X]X acjY UkUm Zfca]bghfiaYbhU` h\]b_]b[) h\Ym hYbXYX hc X
]bghfiaYbhU` h\]b_]b[h\Uh kYfY dfcj]XYX Vm HWYUg]ghfiWhcf
UWh]j]h]Yg+ M\Ym ghfi[[`YX hc aXjYh cVYXcbX h\Yg Y YgWYbWf]gYg
ghU_Y\c`XYfg k\c kYfY jYfm X]ZZYfYbh Zfca h\YagY`jYg+

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?fca WcadUf]bY WbYgYghiX]Yg) U ZYk]bhYfYgh]b[cVgYfjUh]cbg
giffdf]g]b[h\Uh h\Y gcW]chdYUWbY]WUb` UWggYg hU]ibXUW]h`c]chm Wc ifgY-
fYdYUhYX`m ghUhY h\Uh h\Y Wcd f g Y]hYgUhs hY[W]gb]WU`f)gtY Vhichd]Wh a]g
]hgY`Z h bUUi f bY[fUh]cb cZ gcW]chYW\b]WU` Wcbg]YXKMUW]cbg h
Wcbhfc` gWcghfNgAS+

:bXfUXY UbX McaV`]ba]bdhY]fbYhg hc]ibh[UbX]adcfhUbh`]a]hUh]cb cZ
UW_bck`YX[Y h\Uh g cW]b c h YW\ b gUWbX ald`Yl]_Y`m]bZ`iYbWYX Vm ai
]bW`iX]b[h\cg WcVYmcbX hU]iY\h]b -M\g-cYMAZMEk WYX]fYg
Wcbgh]UgZk g YkU]ahUYWi`Uh]cbg cZ h\Y acXi`] cZ Y`Ugh]W]hm h\
4A?D=JE?N KB Wc=IOAMS=AN]lg)]g X]ZZ]Wi`h hc gUm h\Uh cbY Wcif
ibXYfghUbX]b[cZ gcW]chYW\b]WU`]ggiYg) aiW\`Ygg U g]b[`Y
UbX jYfm`]_Y`m h\Udck hYfYfwq bZgYg bWYgZY YldYf]YbWYg) UbX g
U`gc]adUWh g gW]X Y YWg bY]WU`YfY+

?]bU`h m]g]X]ZZW]W]iW]bY d`gYdW]chYW\b]WU`qY]ghYW]fU`h`mc bh\Uh k\]W\
acjYg VYmcbX YWcbca]W UbX Ybj]f b aYbXUf Wc bYc]XWYfUhg YWgbX

g cW] c hYw\ b] WU0 3q] b] bU] b] a] hYX U a c i m h b Y W Y g k f m X Y l U a d` Y g
k] h\ Y Z Z Y W h] j Y g c W] c h Y w\ b] W U` W c b h Y m f U b Z c b a b U] Y b h] d Y Y g Y b h X
d Y f g d Y W b b X Y g h\ d k g h i X Y b h g h c d f c: W X g f U X b X U b X] g M c i a g V g`+] a v g k c f_
Z c M` U g g k\] W\) X Y d Y b X] b[c b h\ Y W W i c b g Y X g W Y X X h` g Y a Y a b[\ M m V Y
Z U W i` h m a Y a V Y f g+

* @ 5 E C + B - @ H A : @ 6 C

? c f g h i X Y b h d Y f h g \ W Y W h f U j W h g Y f c] g h] W g c Z Y Z Z Y W h] j Y g c W] c h Y w\ b] W U
f Y g Y U f W\ e i Y g h] c b () k Y X f U k Z f c a Z c W i g [f c i d X U h U c V h U] b Y X
W` U g g Y g Y U k c` c f U X c L W\ U c d i d Y Z Y W] b] b] g Y W] b] b] j Y f g] h m] b h\ Y k Y g
N L + M\ Y * g h Y f a i] W h d W Y X Z f c i d e i Y g h] c b g U d d Y U f X U b h U\ U g d d Y b X] b Y
U b X U b U` m n Y X j] U c i f * U d d g h] Y X h d c b W Y g B K g +

M\ Y a Y h\ c X W Z g f [Z c i d ' ? @ (X U h U U b U` m g] g] h j c\` Y c Y m U a c X Y Y U Z a c` f]
e i U`] Y U h h g B O S f m : _ Y m U X j U b h U [Y c Z h\] g a c X Y`] g h\ U h U b m h\
W U b V Y W` Y U f` m h f U W Y X V U W _ h c g d Y W] Z] W g h i X Y b h g h U h Y a Y b h g +

M c d U f U d\ f U g Y U b c h\ c X Y g f Y g M X X W\ W c b) Y g W] b h\ Y X U h U U b U` m g] g d
W U h Y [c f] Y g \ Y` d h c W f Y U h Y B O 6 S m f Y g W X U U b U b m g g U g g Y h c b W c X Y g)
f Y g Y U f W Y g h f Y b Y j U b h W U h Y [c f] Y g) U b X V f c U X Y f h\ Y a Y g + M\ c g Y h
c j Y f U f W\] b [) g i c a f] U g] j c Y U g Y Y f h] c b g U g V X Y d B O 5 Y X X S M e .
Y l h Y b X h\ Y U b U h c a] W U` a Y h U d\ c f) h\ Y a Y g U f Y g h U h Y a Y b h g h\ U h
g _ Y` Y h c b Z] h h c [Y h\ Y f) U b X h\ Y c f] Y g c f U g g Y f h] c b g X Y d] W h\
] b h Y [f U h Y X k\ c * W Y X Y M h Y * K U M h Y Y c f m Y a c X c j Y g f Z f U h W c b W m Y h Y h c
U V g h f U W h U b X] b j c` j Y g U \] [\ ` m] h Y f U h] j Y d f c W Y g g c Z f Y Z] b]
f Y W c b g] X Y f f Y` U h] c b g \] d g U a c b [W O X Y g) W U h Y [c f] Y g) U b X h\ Y a

M\ Y Z] f g h d\ U g Y] b h\ c Y Y d f U W X g M X B] j b c [+ j Y K d Y b W c X] b [] b j c` j Y X
U b m d\ f U g Y c f] X Y U h\ U h \ Y g c b W Y U d d h U f Y h W g f c f g h` i n X Y b h\ Y] f c k b
i b X Y f [f U X i U h Y Y b [] b Y Y f U b h] W X] i U h Y X c b`] Z Y V Y h c f b X] b h g H U h W Y X] i W U h
h f U b g W U g g U [Y g W c i` X V Y W c X Y X h c d] W U` ` m U g s Y b [] b Y Y f] b [k c f
s Y b [] b Y Y f] b [U d X U W h] W Y W c X Y g] b g d] f Y X V m h\ Y X U h U V m Y U W\ a
h Y U d + f h\ Y f U b U` m g] g W c i` X d` U W Y g i W\ W c X U g Y] b h c b Y f Y Y g h Y X W W U
] X Y b h] Z] Y X h) \ c W g h Y [W h m] b [h\ Y > b [] b Y Y f + t : b U` m g] g c Z h\ Y W
X] g W i g g Y X \ c k h\ Y m W c b g h f i W h h\ Y k c f _ c Z Y b [] b Y Y f g ` Y X h c
Z i h i f Y ` Y U U b X b Y j Y b h i Z] b X h h U h h g M i X Y b h g f g X Y d f Y U` Y a g U g U V f]
V Y h k Y Y b h\ Y Y b [] b Y Y f] b [W i f f] W i` i a U b X Y b [] b Y Y f] b [d f U W h] W

M c W\ W W h Y b b d U f W Y f Y g Y U f W] U g f i` h] d` Y f Y g Y U a f W b Y a f g a c Z h k c (
W c b X Y X g Y d U f U h Y U b X` m g Y g f h Y X h\ Y] f Z] b X] b [g] b] b X] j] X i U` U
k\] W\] b W` i X Y X h\ Y a Y g U b X U g g Y f h 0 S b g Z c U g Y X W Z] B a W i Y m Y L U i X U b
Z] b X] b [g k Y f Y c Z h Y b g i V g h U b h] U h Y X Y b] h\ Y U f Y W h Y g h i X Y b h e i c h
b Y [c h U W Y X] j] a X i a c U b X * W c] b Y W c b g Y b g i B b a Y a d Y g Y a Y a k g f X h
W c b g Y b g i g X c Y g Y g Y U f M U Y Y c b U g] b [` Y] b h Y f Y b Y U U d] f W S V] Y g h Y
h\ Y m l d`] W] h` m] b W` i X Y d c] b h g] b k\] W\ k Y] b h Y: f d g f c Y h Y X b c f W U

gcaY WUgYg) fYgYUfW\Yfg k\c \UjY WcXYX dfYj]cig hfUb gWf]dh
 UbX`dWY ghiXYbh ghUhYaYbhg Xc]ffYh\h`anY+]Bhbc hU]WgUhgYh[iXfm) hkc fY
 kfchY gYdUfUhY UbU`mhZ Wf\Yg dU]fW\c Za YzacXGUY\ [WoiidWgYV]b]b[
 h\YaYg k]h\ giVghUbh]Uh]b[eichYg ZfdW\YUW\ U?@+c MYUXUXh]h
 ?@ hfUb gWf]dhg UbX Wcbgi`hYX cb h\Y Mf]g]bZcicZ hYXVWf]gYgZg
 fYgYUfW\ hYUa Wcbgi`hYX cb YUW\ WcbgYbgig aYac Zcf h\Y hkc

, LMEKMY[cf]Yg kYfY YghUV`]g\YX Vm dfYj]cig `]hYfUhifY) Zc
 gcW]U` UbX hYW\ b]WU` VRSX]YgkcZ\YmcKbYK[YR]SVU]hX cZka]bXm
 X]gWigg gcW]chYW\ b]RWS]RI Sfb[MbYYWf]b]fgYg UbX .6 dUfh]W]dUbh d
 UddYUf]b.+MUV`Y

MUV`.Y Ldf]b[/-.[f6i]dgK]g]b[]bYYWc]ibf[gYg]hiXYbhg kYfY]bj]hYX h
 h\Y]f cK]bXYbcb]Zm]b[dgYiXcbmag+

(@EBC7	*@5EC +B@EA !	.4BD;5;A4?D .C7E6@?H>	.4BD;5;
Bbhff>	-.	;cV) ;f]Ub) <`YcdUhfU) =U_	3
Bbhff>	- /	<c`gcb) @fUWY) DU]) UbX LY	1
>`YWhfbY]d	-0	<\YXXUf) IYddYf^UW_) FcnnU	1
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 gcd\ca`eYY]bhfcXiWf]h]b]WU]bYYf]b['BwchiffcYUbX U`*iYj]Yc`f
 Wc ifgYbq]b]bYYf]W[hfca]d['b>Yh]WghfbYh]d]md]WU` `m hU_Yb Vm ghiXYbh
 aU`cf]b[]b Y`YWhf-]MUXYb]b[d]bYgdfYWh]j]hYgY Wd\Uf[YYb]cYbg Ug gcW]Uh
 k]hk\cf_]b[hYfYgcfjX dfcV`YZUW]K\]hW]hYX X]jYfgY Zcfag cZ gcW
 h\]b_+U]U UfY fYdUf]gYXh]YfWcbhYlh]b kKdW\XgdWdVfYUW`gc`j]b
 kUg XYgWf]kYX g dYW]UXYgMfY]h]h]cbgh`cZf\XkYfYUd`Ygc]hYXY Yad`
]Wc ifgYgY]bWUhiXZfca Vch\ Wc ifgYg k\Yb Udd`]WUV`Y+

:bU`mnY]b[]bYYgfh]bX]X]gWf]dh]YUgfc`X Yb[]bYYf]b[dfcV`Ya gc`j]h
 [YbYfU` `m \UjY bch mYh*c\UXY]Yd]YhY]bYg]W]Yg \g]cbX]g]b]gYgY gdfcV`Ya
]ggiYg+ LhiXYbhg UafYkY]Yb^Y]W]h]cf]a]th[\cgY Wcb^YWhifYg) kY`YUf
 WcbghfiWh h\Y UWhiU` fYU`aU]X Yb]k]b]Y]Y]g]b]Wc]ad]U]h]W]W]YX hc h\
 dfcZYggcfcg UbX +cb]gYcf Xcl]dbY]h]gkY [U]b UXX]hg]cbX]Yb]d]g]b]K[X]c]bh
 bch jU`iY]b h\Y Yb[]bYX]h]b[Wiff]Wi`ia)

*@5EC +B@EA * ;?6 ;?9C

PY cf[U]b]hY XYgWfc]idh]b]Zc]ZbX]b[g hUWWdW]h]b[ch]dUhg YaYf[YX
 ig]h]Y aYh\cXg XYgWf]VYX]b7 h\Y dfYj]cig gYWh]cb

- A KYUPcf`X]Uad`]Ybg h\Y >b[]bYYf]b[<c ifgY
- A KYUPcf`X]Uad`]Ybg h\Y >b[]bYYf]b[<iff]Wi`ia

•A KYUPc f`>Xl Uad Ugg; f]X[Y ;YhkYYb >b[]bYYf]b[<i f f]Wi`ia Ub
I f UWh]WY

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Bbg]XY h \Y ~~Bb b h~~ l h c c ~~Z~~ XW h b f X a Ua[]b Ygh]ig ~~X~~ X b h g]Z]YX k \Uh h \Ym Wc b
h c VY* k f YUX d f c V`Y h \ ~~U~~ h `] ~~b~~ b f ` ~~Z~~ Y X g h Y W Y X h Y W \ b] W ~~U~~ B b h g \ c] d Y] b [
WUgYg) ghiXYbhg U`gc WcaaYbhYX cb \ck gcaY UWh]j]h]Yg X]X

Bb Bb h f c) ghi ~~X~~ Y f h g d f Y g Y b h Y X k]h \ XYg] [b] g g i Y g U g g c W] U h Y X
V] ` ` g Z f c a c h \ Y f W c i b h f] Y g) N + L + V] ` ` g U f Y U ` ` h \ Y g U a Y g]
d f Y g Y b h g X] Z Z] W i ` h m Z f f X j] j ~~g~~ X U U ` g h a d X] g f Y X b [i] g \) Z c f] b g h U
V] B b + ? @ - /) @ f U W Y b c h Y X h \ U h Y b [] b Y Y f g k \ c U f Y b c h j] g i U ` ` m
W c b g] X Y f g i W \ U X Y g] [b Z ` U k) U b X U h \ ~~d~~ Y h g h W W Y b \ h c i U X h Y X Y Z c [f U [\ Y a f U
s A c k X c Y g h \ Y b c f a U ` d Y f g c b [Y h ~~Z~~ Y X X b U W U b h g c Y h \ Y c R b] [h] b W U b f V Y
f Y U X h \ U h V] ` `) R i g h t S B a \ U c j h ` b b c] b ~~X~~ X h U - ? @ L \ Y] g U h X U h h \ Y
N + L + W i f f i U b W m Y a U X Y \ Y f f Y U `] n Y \ c k j] i g Z W] ` f m h] a d X Y f g Y X b U b] X g V
d Y c d ` Y) U b X s ^ i g h V m ` Y U f b] b [h \ U h c b Y h \] b [f Y U ` ` m c d Y b Y X
h \] b [g] b g c W] Y h m h \ U h Y b [] b Y Y f g \ U j ` Y - 7 D b ~~X~~ 6 g h h Y g Y Y X W U g h g c b
k Y g Y Y h \ U h h \ Y k c i f g Y X c Z l U a d f Y U ` k] h \ g d Y W] Z] W g c W] c h Y W \ b] W U ` ` Y
X Y j Y ` c d g ~~d~~ Y W] Z g W c Z a] b X] b h \ Y g h i X Y b h g) `] _ U b X U ` i] b [g h U _
W c b g] X Y f] b [a i ` h] d ` Y) X] j Y f g Y i g Y f g +

< ` Y c d U h f U] b ? @ - . U g U g X W g c h Y W a c h b h X U] h m X Y f j] Y k U g ` g Y Y S R Y b h
Z c X Y h U] ` g c b h \ Y j W ` g i U X c b h Y h a d (\ U g] n] b [Y * Y a f Y X h g f c Z ` Y a U ` g c ` j] b
L \ Y g d c Z Y Z f] Y b X k \ c] g s U W] j] ` Y b [] b Y Y f R k] h \ S U f Y U ` ` m X
h \ Y m \ U j Y h c ` c c _ U h h \ Y V] [d] W h i f Y h c h \] b _ c Z U X] Z Z Y f Y
c Z g i d ` j U V ` Y) U b X] h & g ^ i g h W c b g h U b h h Y U a k c f _ U h X h \] b _] b [U
' - - 7 . 4 7 0 0 (+

B b > ` Y W h f c a U a [] b Y h @ g d U f h] W] d U b h g] X Y k b c h f] X] Y d X f c g Y j Y a f g U ` h \ f U h U ` Z U W] `] h
g c W] c h Y W \ b] W U ` h \] b _] b [+ M \ Y g Y Y ` Y W h f c a U [b Y h] W g d f c V ` Y a g k
Y Z Z Y W h] j Y ` m Z f U a Y X V m h c Z @ f U b X Y c f U b [k Y b] W \ g k Y g Y X b h \ Y
W c i f g Y c f] b g h U b W Y)] g U j X - 0 \ U h \ Y X X U f

M \ Y _ Y m Z c W i g] g h c U X X f Y g < > S U W h X R c Z X h U Y ` g Y U b W h Y X b X c Z
` Y U f b h \ Y g i V ^ Y W h a U h h Y f U g g c W] U h Y X k] h \] h V i h U ` g c i
g c W] Y h U a d U W h g] h \ U g R h g c Y Y] b Y g h Y h \ W c h i c [h a d] W U ` * m Y g [U b] W U g ` c W] c
Y b [] b Y Y f] b [)] h & g _] b X c Z ^ i g h Y a Y f [Y X] h g Y ` Z] b h \ Y f Y
k \ Y h \ Y f k Y U f Y U k U 0 4 7 6 Z] h c f b c h +

M \ Y @ f U b X < \ U ` ` Y b h f c g X k W Y X d f] a U f] ` m X X Z] Y Y X f U] Y h h c Z g] d f Y f h
Y b [] b Y Y f] b [d f c V ` Y a g h \ U h W i f k Y c h h B b M \ Y g Z c W] h g \ Y h i c X h d Y h g f Y U `
f Y W U ` ` Y X a U g h Y W Z Z h W c Y f Y U U a d h Y g h g h Y a a Y X Z f c a h X] Y g W i f g U X b g c Z
X Y Z] b Y X @ f U b X + < \ U c f ` Y] b [g h U b W Y) Y \ Y W h a d b b] W b h X X] U h] c b Z f c a

WY` ` d\cbYg) `UV cb U*Wf]X) dUfWU`hU`gYnf]fYU VYhhYf ibXYfghU
gcW]chYW\b]WU` h\]b_]b[]) Vch\ Uh g]ad?jbgghUWbWbX acfY Wcad`

?@-0) FcnnUfYBhEg _]bX*fccZ bXYXW`Ugg UbX Rh\Y]bghfiWhc
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Udd`]WUh]cbg+ ?cf YlUad`Y) kY ^igh hU`_YX UVcih h\Y gc
cb am gdf]b[VfYU_ hf]d) kY XfcjY dUgh U aUgg]jY gc`Uf
VYWUigY]h kUg Y&gYbU"AYX)Ugcih h\cgY+" B \UjY U aiW\`
cZ h\Y UWhiU` igY cZ h\YgY bck+ B&X gUm]h gYYag fYU``
ch\Yf W`UggYg UbX V(k\Yb B kU`_ UfcibX) B gYY ghiZZ h

?@-0) <\YXXUpf 7B .h0\7]0b4_ k\Yb BhYW\Uf]WU`cW]bc[]bYYf]b[]) " B h
ibXYfghUbX]b[h\Uh h\Y h\]b[g h\Uh kY) Ug Yb[]bYYfg Wf
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aU_Y UbX YjYfmh\]b[kY WfYUhY \Ug U WcbgYeYbWY hckUfX
dYcd`Y h\Uh kY aU_Y]h Zcf UbX kY \UjY hc hU_Y h\Uh]b

?@-1) Cc\bUh\EUW 00 702 2W\]d+ :bX h\Y]XYU hc WcadcgY hY
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ZYYXVUW_ cb aYX]WU` hYghg]gb&h h\Y VYgh h\]b[]) YgdYW]
aYX]W]bY]g jYfm X]ZZYfYbh) UbX aUmVY `]_Y]b U \cigY\
]aaYX]UhY`m]g bch [fYUh+

?ifh\YfacfY) ?@ dUfh]W]dUbhg UWWYbbhiUHXf`Xc kd fYcW`cYgaigfY]thc a
>`YWhfcaU]bYhd]YX h\Ya ibXYfghUbX k\m ghU_Y\c`XYfg UfY dUfh
h\]b_]b[dfcWYgg+ LhU_Y\c`XYf]bjc`jYaYbh bcbXc [Xf]VYWUadZ U
UddUfYbh UZhYf h\Ym Ug_YX dUfh]Wi`Uf eiYgh]cbg) gcaY cZ k\

?@-1) IcbmVcm7 027/- PY U`kUmg p Ug_ h\Y h\fYY eiYgh]c
`]_Y k\c XcYg h\]g VYbYZ]h) `]U`X kp ck Xc Ygc Ygb]gh bcb]j WYU
cf gcaYh\]b[`]_Y h\Uh+ :bX p]h _]bX cZ ghfiW_ aY VYW
E]_Y \ck Xc kY \UjY h\Y f][\h hc gUm k\c XcYgb&h \UjY
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`]_Y k]h\cih dYcd`Y&g +++ E]_Y h\]g gdYW]Z]W [fcid cZ
Xc]b[+

?@-1) Uh\Bb03M2Y V][h\]b[h\Uh B \UXb&h Wcbg]XYfYX VY
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@YbYfU``m) d h f XWpUhgYX h\Y cddcfhib]hmfYU`WcbXg]hYbW\h]WUfUW
h\]b_]b[h\fcil[cbhUhgY]W aYb]Y) X]gWigg]cbg) UbX YlUag) k\
kUg a]gg]b[Zfca h\Y]f ch\Yf hYW\b]WU` WcifgYkcf_+

?@-0) FcnnUfY``U7 037iYgBYcbUpY YjYfm hYgh+ Bh&g `]_Y)
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[]jYb hYW\bc`c[m+

?@-0)cFnUfY``UW\Y.704hfiWhcfS \Ug []jYgh iRYbMWhSf caU[bYh]
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h\Uh g\ci`X g]h aYYXkUWhUbXbYXX`ha`cc_ Zcf h\YgY .- h
[]jYg mci h\Y cddcfhib]hm hc h\]b_ UVcih R]hS mcifgY`Z

HbY ghiXYbh Wcbg JXXffYX dh\AV`fYUg` h\Uh ZUW]`]hUhYX gcW]chYW\
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?@-1) Uh\Wb472. B h\]b_]h&g Uh `YUgh]adcfhUbh hc \UjY
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hU`_]b[UVcih \ck gcaYh\]b[WUb VY Udd`]YX) U`h\ci[\ B
^igh aU_]bUhgYfYfYh\ghYd h\YfY&g Uh `YUgh gcaY gcfh cZ
ig Wcbg]XYf X]ZZYfYbh d]YWYg cZ]h+ ;YUuigY h\Yb h\Uh
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FUbm cZ h\Y WcaaYbhg]b h\Y gYWh]cb ?@VdJf hZ]WcdUbhYgWUWwauBhb
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Udd`m hkcfcfYX`dfcV`Yag]b]bXighfm,Yb[]]GXYUMb[m]kafc_gdh`uWY Wc
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Bbh fF>hcM\]g ZgghVXXfYggYXWc]bW`hi\g]cb cZ h\Y dUdYf

8A=~~R~~KMH@S= I L E A N ~~A~~D A E J A A M P H I M E ? P H P I

Bb UXX]h]cb hc cVgYfj]bdf XWadkY]h]ghYwZZ fWUbhmchhY F>
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]b ch\Yf WcifgYg]b h\Y Y;YW]biYyf]b[YgWi fch]\Wif` Wac+fgYg kYfY b
fYgYUfW\ ghU]Xm)ZXYf XYhU]`g UVcih]a*dcYàXbYUdadbYgZVhhYWU
gh]`` `YUfb Zfca ghikYbng fZUffYg+]fYXXWbHg WcWfgYX)cU Z]
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LhiXYbhg]Zf c?@-h\Y BbhfcYhd\Ug]WYMYW\b]WU` *UW\bb]WU` VcX]Yg
cZ _bck WUX[Y]bhYf?gYWh]bghUbWY) @fUWY gU]X h\Uh g\Y bck fYU`
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kUg U h\YaY h\Uh fUb h\fcil\ aUbm ghiXYbh WcaaYbhg+

@YbYfU``m) g~~hWXYX~~gm]U~~XX~~kYXYh\Y Vi`_ cZ h\Y Yh\UbYXfYm[Wif
\UX YldYfU]g~~hWYX`Y~~ UbX fYacj~~YX~~) Z~~XYU`XUWX~~g]bYYf]M\YdfcV`Yag+
U`gc]XYbh]Z]YX k\Uh h\Ym gUk Ug Wf]h]WU` [Udhg\Y]bZUW\Y]hf\Uhb
k\]\`Y Ybj]fcbaYbhU`]ggiYg UfY X]gWiggYX]b Ybj]fcbaYbhU`
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Bb hYfag cZ h\Y fc`Y cZ gcW]chYW\b]WU` Yb[]bYYf]b[]b h\Y
;cV]b ~~b@h.]U~~`m gU]X cZ gcW]c~~hWXB~~YUdcY~~Yb~~h]Y~~Y~~gf~~h~~b[hYUW\ U
&WUigY]Z mci&fY [cbbU XYg][b gcaYh\]b[k]h\cih Wcbg]XYf]b
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X]ZZ]Wi`h Y]cb]Ubgh\U~~U~~UfX Yb[]bY~~Y~~g]U~~V~~c ~~U~~hYX]WY`icak+

?cWig [dUfhd]W]d~~U~~bYWhfbaU[Z~~W~~h]ggYX cb h\fYY fYei]fYX WcfY Wci
idd~~X~~f]j]g]YWh~~Y~~WU~~b~~YYf]b[WcY]f~~g~~WgcaaYbhg Zc~~W~~é~~g~~YX ~~Y~~bU~~U~~UYg
h\Uh ZUW]\`]hUhYX Ub ibXYfghUbX]b[cZ \ck)]b jUf]cig kUmg)
dfc`Wag]bhYfUWh+

?cf YlU~~q~~~~h~~`Y~~q~~I~~h~~ddYf YCUWYggYX U [YbYfU` UddfYW]Uh]cb Zcf h\Y
Yh\]WU` X]aYbg]cbg VY\]bX Y~~h~~aYbYZf]h\Y] d]h~~W~~UfX]bbZsdfYj]cig
dfYj]cigcZ]X~~X~~gUghYfg h\U~~h~~Znfca WU~~X~~ h\Yb]b W`UggYg]b h\Y Z
WUb _]bX cZ dfUWh]WY~~h~~U~~W~~\bm]WU[h\Y]g~~W~~W]c]k+

LhiXYbhg W`YUf`m d`~~U~~WYX XjU~~Y~~lU~~Y~~dc~~Y~~gfYUWfcgg h\Y Yb[]bYYf]b[V
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IcbmVdm~~7~~03 Bp`Y]g~~W~~U`m`]_Y]b W`UggY~~g~~]h~~Y~~g~~Bi~~[\igihh am
ZcibX]h fYU``m]bhYfYgh]b[`_]_Y ~~R~~]Z~~Y~~ ~~N~~\Uad~~f~~Y~~Z~~YgEd~~f~~Y[U
ghiXm]b[gcaYh\]b[UbX]h&g `_]_Y c\) h\]g]g k\Uh h\]g
"H\) c_Um!" :bX gc]h&g Wcc` hcY`~~U~~bX)mk\&~~h~~YmkU`_]bY Uf
mci&fY `_]_Y) mci UWhiU``m _bck `_]_Y h\Y gW]YbWY VY\]bX
^igh `_]_Y h\Uh ^igh XcYg gcaYh\]b[+ E]_Y mci&fY Xf]j]b
k]fYg \Y`d aY VY UV`Y hc gU~~h~~\`Y a~~h~~b]hf~~U~~bXa~~h~~U~~h~~W~~g~~ccgZ :aYf]WU
`]_Y ~~h~~\Y~~h~~g hcd`YjY`) Vih]h&g _]bX cZ Wcc` hc [Yh h\
\UjY acfY]bZcfaUh]cb UVcih h\]g h\]b[h\Uh mci fYU``m
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<c`gcb77--B0h\]b_ cbY cZ h\Y V][h\]b[g]g h\Uh)]b h\Y
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W`Ugg) Zcf`cif hYgh]b[) kY&jY hU`_YX UVcih h\Y Z]bUbW]
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kY [chhU aU_Y gifY kY [Yh YjYfmh\]b[f][\chaYhXcjB&h XYgl
XcYg \UddYb) k\Uh Xc mci Xc h\Yb9

=Ygd]hY gYY]b[gcW]chYW\b]WU` WcbhYlh]b Yb[]bYYf]b[dfcV`
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U[fYYX) \ckYjYf+ Bb ?@-.) ;cV]bX]WUhYX 'UbX IYhY U[fYYX(
RgcW]chYW\b]WU` Yb[]bYYf]b[]gS ^igh Ug]ad'c-fhUbs7Ulg()hYUW\
YjYb]Z]h]g) \Y UXXYX) bch bYWYggUfm hc fY]bZcfWY gcW]ch

FUbm ghiXYbhg gUk h\Y hYUW\]b[cZggfWdcfhWb]WUh Yb]h]bYYf]b[
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gU]X)

;ih B&a VY[]bb]b[hc kcbXYf]Z hfm]b[hc hYUW\ RgcW]ch
h\Y UWUXYa]W]ggYiWhUfY U`acgh Uh cXXg k]h\ YUW\ ch\Yf
VYWUigY B h\]b_ h\Y gcW]chYW\b]WU` Yb[]bYYf]b[mci `YU
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gcW]chYW\b]WU` Yb[]bYYf]b[-70270H(Y W`Uggfcc a+

?cf aUbm ghiXXcbfh`X) YbY[U]bYYf]b[dffYV`YWh]ZcbgkYfYX dfcUW\Yg h
Udd`m]b[Yb[]bYYf]b[_bck`YX[Y UZhYf [fUXiUh]cb+ GchUV`m)
fY`YjUbh cf igYZi`]Z h\Ym fY`UhYX X]fYWh`m hc k\Uh ghiXYb
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Dfiad7 -B70Y` `]_Y Rb\YYWZUWchaU[YU]h]bgXgS cb I\mg]Wg /) `]
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\ck) YgdYW]U` `m]b h\]g fWXUg d`k]WUW]hYUfYU]fX]gWiggYX UbX
\ck >%F fY`UhYg kcfhXYgYdfBWU]h]cbgh\Uh WcbbyWh]cb aU_Y
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P]h\ h\Uh)]Z U W`Ugg ZYY`g uigY`Yggv cf u]ffY`YjUbh)v ghi
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<\YXXUf7/ Q.c7^igh VUgYX cb am dYfgcbU` jU`iYg) h\YfY]g
WcbgW]Ybh]cig cZ YjYfmh\]b[h\Uh B XYg][b+ B h\]b_ Zcf
WcaYg hc a]bX k\YbYjYf B `cc_ Uh U dfcV`Ya)]g]Z]h&g

hY [fYUhYgh Uacibh cZ [ccX Zcf h\Y [fYUhYgh Uacibh cZ
XYg][bYX ^igh Zcf cbY WighcaYf+ P\Uh UfY h\Y]adUWhg c
UWWcibh h\Y ghUbXUfX `YUX h]aY+ Ack ZUgh Xc hh\Ym bYYX
Zcf h\YgY dYcd`Y hc \UjY h\Uh gc`ih]cb VYWUigY h\Yb Ua
dYfgcbU` h]aY+

FcnnnUfY``U7 0/7/- B _bck Zcf aY) U jYfm ach]jUh]b[jU
cZ df]XY) `]_Y k]h\ am \caYkcf_ UhbcX dki]hh \]U)bnBh \k]Ubb[h] HB&a
hc gUm) "H\) mYU\+ B X]X h\Uh)" gc B _bck k\Yb Xc]b[k
`]_Y) h\YfY a][\h VY Ub YU]Ygf]hUm fh BUWUB Wc i hX]gU fZ [\
cZ h\Y h]aY)]h&g) B kUbbh hc KcX Yf]gUfX [\]h+cB B kUbbh h
"AYm) B XYg][bYX h\]g+" E]_Y g\ck am Zf]YbXg+ Lc]h&g
cZ k\Uh B&a Xc]b[) gc B Xcb&h fYU``m hU_Y h\Y g\cfhWi

L]a]`Uf X]gWigg]cb YaYf[YX]bfh]YgkUbbWY) ?@q\hUh kUbbW\kZYb U
Yld`U]b h\Y aYUb]b[cZ gcW]chYW\b]WU` Yb[]bYYf]b[) gU]X) s
VY\]bX]h) fUh\Yf h\Ub uB kUbbh hc gc`jY h\]g]bhYfYgh]b[d
bYYX hc gc`jYa h\B&adfcYb[hc gc`jY]h]b U kUm h\Uh Zi`Z]`
RbYkS dfcV`Yagt ' . - 714(+

1E997CD;@?C

;UgYX cb cif fYj]Yk cZ kcy`X]YYUad iYYg UbXfYUW]chYW\b]WU`]
h\Y ZcWig [fcid XUhu fYHc]hYXVUVc]YU WYkcfKgcYb UcaZ`fYU Ug
h\Ym UfY hmd]WU``m]bhfcXiWYX]Ubx UbbhYbg]b]kYgZ]WU hWcUggf c
dfcaccg hW]chYW\b]WU` h\]b_]b[Ub]b hccc hYbWh] Uf]UcaidhWcgaYg

MUV`Y / P cKYU` >1Uad`Yg k]h\ LcW]chYW\b]WU` BbhY[fUh]c

	(0 ,69 ; 6 / \$A , 7 : 60 <	B +4=3) 9 . 49=0 . 384 . , 6 % ,
" 98=08= 9	2 : 8=C>86A# B6C=AB6]DCH=; 8DC8 : EGMLC ; GIBDGA9A8DCI	P -MEA>8>IAN EG8H:GG:9CE G:A6I67A: HD8>EAG8DEH:M= HI6@:=DA9:G GC69GC8H#H# 9>H8JHH>DCH# :I8%
#0<4;0/ 60 9>=.92	/BEGDK:9 :M6B E:G;DGB6C G:I:C#>DC8G:6H:9 :C<6<:B I=: B6H)G>6A	P ,::E:G A:6GC>C< L>I= > G:8%/A8G:6H:9 6A><CB:CI :C<>C: EG684>8%
'=30,9=08: :9<4= 9>=.92	/C8G:6H\$9; H:86;8BEGDK:9 D ;DG ;:B6A:4HJ9:CIH	P 1DI:CI>6A ;DG >C8G:6H HD8>6A G:HEDCH>7>A>IN 60 8DCH>9:G6D9DCH<6<:B:CI L JC9:GG:EG:H:CI:9 :C<%C: P 3>I=\$A8H9>H8#HHD>DC:B G:LG>4(5H:CI:GK>:L 6H#>5CB
*<0 @4=3 .6,<<;	-M6BEA:H 9JG>C< A:8IJG: :M6BEA:H !>I:BH I=6I HI B6C>EJA455:"	P .DB:LDG@ EG7EGIB6C9IH# :M6BH HDB4:8=C8DC6A:MI%
&0,;84 ,<<0<<7	,:8DCI:MIJ6A>O:9 =DB:LDG :M6BH	

#; , @ - , . 5	2>B: G:FJ>G:9 I=6I I6@:I	2>B: G:FJ>G:9 I=6I I6@:I
=; , / 0	I6H@H5	I6H@H%D;I:C I6@:H BJ8= B EGDE:G HD8>DI:8=C>86A >(>C8AJ9: 6 H>BEA: G\$DCA:9 :M6BEA:% 0DHI EGD;:HHDGH =6K:CQI B6CC:G# 6C9 I=JH B6N ;: I=: G:FJ>G:9 8DC;>9:C8:

(@ ? 5 = EC ; @ ?

LcW]chYW\b]WU` h\]b_]b[]g Uwcb]hafd]vfiHUb h`gbd]f]YUhf]Uhf] WUbiXYb
Zcf h\Y]f ZiBbfYfWYfYHfgZUW]dfkldkYHh[h]Uhf]f]b[gXaWUX]cb
ghf]j]Ya dh`cYaYbh acfY WcUW]chYW\fbU]h]cb]b]kcfXUW`chfgYgiXYbhg hc b
cb`m h\]b_]b h\Y hYW\b]WU` X]aY`kg]f`k VihUad`Yg UbX gdfWYUYa
^igh cbY kUm h\Uh gcW]chYW\b]WU`]bhY[fUh]cb WUb VY]ad`Ya
YhU[YX]b h\Y]f WcifgYkcf_ k\]\`Y U`gc dfYdUf]b[h\Ya Zcf V

KYU`kcf`X YlUafdY YcgZ hYbYX]b Yb[]bYUfg]b]b YXZZWWh]c]bY dYXU[c[]W
hYW\b]eciKYjYaf) h\Ym \UjY bch VYYb YlhYbg]jYYZ ZUWk]gYUW]Z]WU
]bhYfjYbhhgc hYbh]cbYX`kVYZXfYgWYbUf]cghWZbfWgaYZ]b]ad`Y
YlUad`Yg h\Uh `Ugh U ZYk a]biHYg hc YlBbbg]j]Y dUdYUWhgYhYU
k\Yh\Yf cf bMY H\BYmY ZUWWh]jY Zcfa cZ gcW]chYW\b]WUg`]bhY[fU
cbY cZ h\Y WUgY ghiX]Yg dfYgYbhg) gcW]chYW\b]WU`]bhY[fUh]
ZUWhcfg h\Uh aUm UZZZWWhgighiXYYXU[j]YUg UbU`cbfca UWZYgh aUm VY
udYfZYWhv dYf gUm+

?cWig [fcid XHhX]WUWUg h\Uh h\Y`YjY]aUgh]iXb`hig]kbg a`YWhfcaU
aUXY ZUf acfY WcbbYWh`kcf`gXVYHf`kVYUafYU]b h\Uh WcifgY UbX gcW
h\]b_]b]b\Y`Ug`m gcd*YjYfYghiXYbhg]b BbhfcXiWh]cb hc FYW\U
M\]g]ggiY aYf]hg Zifh\Yf fYgYUfW\ hc YXWYXfY]bYfhhYfYUgcb
ZUWhcfg UfY XYjY`cdaYbhU` '^ib]cfg aUm VY Uh \][\Yf Wc[b]h
'XiY hc YldcgifY hc U [fYUhYf c]YfU`` dYfWYbhU]dYWqZ]W\Y Yb
'fY`UhYX hc h\Y eiU`]hahYUW`Xb]eWU`b h]]hZrc fcaUhg]cWb] ghiXYbhg]bhY
dfcV`Ya gc`j]b[() ch\Yf ZUWhcfg) UbX,cf gcaY WcaV]bUh]cb c
HjYfU``) ghiXYbhg UddYUf hc fYWc[b]nY h\Y jU`iY cZ* gcW]chY
kcf`XaYlUg hc Zifh\Yf h\Uh jU`iY+

LcW]chYW\b]WU`]bhY[fUh]cBk]fbWc fdlcUafYUg kZfYefYb]h]h XYgWf]
h\Y `]hXfUhhdfYh\Y Wead`Yl bUhfY cZ]h+ M\]g hmdY cZ]bhY[
cZ dfYdUfUh]cbbUbXUY]bWf]Uhc X]ZZ]Wi`h hc [YbYfU`]nY UWfcg]
]bghfiWhcfg) MbXigfYUkYb hXg YlUafdY YzgfYeYbh`m dYfWY]jYX Ug YU
]bhY[fU]hY Wc]bf gYgg\cfh UacfiUk`c fZXhY]aUad`Yg]k hYW\b]WU`
]bhY[fUh]cb cZhYb fYeijfY MUdfi]a`cfYh hUdYUUbX XZZa fchf ZcWig
h\Uh`kcfYU`X YlUad`Yg h]YghXiXb hghYUWZYUW]g]jY gcW]chYW\b]WU`]bh
fYeijfYg acfY h\Ub ^ig]h Wcgg]ad`m hYb hYU`bY`XZYfUd`Yg

&5<?@F=769>7?DC

M\]g aJUhYfXfUkg Zfca kcf_ giddcfhYX Vm h\Y GUh]cbU` LW]YbWY
>><*.331/+l /:bm cd]b]cbg) Z]bX]b[g) UbX WcbW`ig]cbg cf fYWcaa
aUhYf]U` UfY h\cgY cZ h\Y Uih\cf'g(UbX Xc bch bYWYggUf]`m
LW]YbWY ?ciGXUhf]WUgcU`gc giddcfhYX Vm]ZNgXyfZfUXihY
KYgYUfW\ ?Y``ckg\]d+

0 7 8 7 B 7 ? 5 7 C

R. 3GUh]cbU` :WUXYam cZBbZ[gdhYYfKbU+ Pcf`X >ldYf]YbWYg]bh<
>XiWUhmPdg\]b[hcb) =<7 M\Y GUh]cbU`.:WUXYa]Yg IfYgg+
R. 4CAiZZ) sAiaUb]n]b[L][bU`g UbX LmghMfYgYbhKXZUMWh]YY :W
:aYf]WUb LcWbYhMYZ]b[>XiWUh]cb UbX2>ldcg]h]cb
R. 5>LiVfU\auB]Ub Yh U`+) sBbhY[fUh]b[gcW]U` UgdYWhg UbX [
XYg][b YXiWbYfYbU]cbU` CcifbU` cZ >b[]bYYf]b[>XiWUh]c
R. 6SL+FcigUj]bYh\UX + sB>>> KYU` Pcf`X >b[]bYbM?AA@EJCNWhg '
KB ODA &\$%& , IAME?=J 9K?EAOT KB /JCEJAAMEJC /@P?=OEKJ ,
/SLKNEOEKJ!
R/ S;+<c\Yb Yh U`+ sBbhfcXiWh]cbYWhb]WYf BbWYg4L@W]CN
ODA &\$%' , IAME?=J 9K?EAOT KB /JCEJAAMEJC /@P?=OEKJ , JJP
/ - .+1
R/ SC+ @UWDYbnp]Y>UfK+): ``Yb)B@pXacif) s:acWc <cadihYf L]ai`Uh]
<\Ya]WU` >b[]bYYf]b[jXiW6h]cbb+t+O>>)
R/ SC+ F+ A+ QY+`AbUUbQ+ C+ Mifbg) ;+ LUhh`Yf) <+ ;]f[Y) UbX
Pcf`X7 : ?UWhcf M\Uh >b[]bYYf]b[?UWi`hm <cbg]XYf]b FU
MYUW\]b6MK?AA@EJCN KB ODA , 94/ &\$\$ (2JOAMJ=OEKJ=H 4A?D=
-KJCMAN@ ≠SLKNEOEKJAd+q1634 Xc]7 . - + . . . 21,B/F5>4< / - - 4
R/ SF+<UadVY``+ sH\) GcKibb@Yh cZh>b[]bYYf]b[>XiWUh]cb) jc`
R/ S?+Fc^]WUI+ <\iUb[+)sLb+UKiKX[YbYfUh]jY AmXfc[YlbmgliWâ <Y``
]6MK?AA@EJCN KB ODA &\$%(KB, IAME?AAMEJCEA@P?=OEKJ , JJP=H
=J@ /SLKNEOEKJ!
R/ 3 L+ ?cfciXUghUb) <+ PccXgcb+) sAck Lc`Uf ;cUh]b[MYUW\Y
<cbjYfg]cb UbX <6MK?fAgU@E]JcW+ tKBIDA?&\$%9K?EAOT KB /JCEJA
/@P?=OEKJ , JJP=H -KJBAMAJ?A 4=J@ /SLKNEOEKJ!
R/ 3 D+ =ibgacfY) C+ Mifbg) C+ QY``]b+) sEcc_]b[MckUfX h\Y
cZ >b[]bYcf]bYh cZ >b[]bYYf]b[>XiWUh]cb+) jc` . - -) bc+
R/ 4>KYYXm CEXWYbU+ s>b[U[YaYbh]b IfUWh]WY IUdYf7 >b[]bYYf
@Yc`c[]WU` K]g_]b h\Y @c`X Lidd`m <\U]b7 Ng]b[@Yc`c[]
<caaib]h]Yg hc HjYfWcaY MYW\b]WU` BbghfiaYbhU]b]ga Uacb[
6MK?AA@EJCN KB ODA &\$%* , IAME?=J 9K?EAOT KB /JCEJAAMEJC
=J@ /SLKNEOEKJ!
R/5SG+Fc[i)` MeaV`)UbX M+ sKYXmUXX7WcbUyh]b[LhiXYbh IYfWYdh
=YWcbhYlhiU`]nYX UbX>b[c]bYh]iU[]hYXV`Yag UbX h\Y]f NgY
hc <fYUhYt>c6MK?AA@EJCN KB ODA &\$%* , IAME?=J 9K?EAOT KB
, JJP=H -KJBAMAJ?A =J@. 6+SLKNEOEKJ!
R. 6SD+Cc\bgych U@YUfsgk]hW\]b[7 ?fca shYWgcb]WUhYWj]g]gWU]tU`t hc
]bhfcXiWhcfm Webhfc`agmgWUbg <WebhfgYt <chZYfYbWY+ ' / - . 3
R. 0SL+ <`UdgXYLa]BbWcfdcfUh]cb cZ <cfdcfUhY LcW]U* KYgdcbg]
VUgYX HbUf]b U LYa]WcbXiWhcf 6MK?AA@EJCN gYB) tOD]Ab &\$%* , I
9K?EAOT KB /JCEJAAMEJC /@P?=OEKJ , JJP=H#6-KJBAMAJ?A =J@
R. 0SM-G]`ggcb+ sP\m :a B EYUfb]b[M\]g9 Ng]b[>jYfmXUm >IUad
?YaU`Y ' :bX FU`Y(LhiXYbh 6MK?AA@EJCN gKb cDAAt &\$%' , IAMI
9K?EAOT KB /JCEJAAMEJC /@P?=OEKJ , JJP=H1+KJBAMAJ?A =J@
R. 0S590/51, 1/+ /JC=CEJC NOP@AJON bLX+/J:WVXAgMKJCb7 ?YV+ 0) /
: jU]`UWhYdg7 , , kkk+Yb[U[YY,b[]bYYf]b[+cf[

R0 S>+IUhhY#8gAc=H 3EBA /S=ILHAN EJ 4A?D=JE?N KB 9KHE@NX 3ANNKJ
>X]h]cb) /- -5) diV`]gYVK VZ FYW\UYdWUha>b[]bYYf]b[] F]W
Nb]jYf+g]hm
R0 S>+LYmacif UbX G+=HGEAYk+KPPQDHAPO@AMEM=@P=OAN HA=QA ODA
N?EAA?AN i`XYf <c`c+7 PYghj]Yk IfYgg) .664+
R0 SG+:bXfUXY=UbcXaV`]a) "/>b.]bYYf]b[] UbX LighU]bUV`]hm7 M\Y
BbhY[fUh]b[] LcW]U` UbX >h\]WU` BggMK?AJA@EJC CN MYW\ODAWU&\$%
, IAME?=J 9K?EAOT KB /JCEJAAMEJC /@P?=OEKJ /,JJP=H -KJBAM
R0 SG+:bXfUXY=UbcXaV`]a) /- .6) sP\Uh :fY M\Ym MU`_]b[] :Vcih9 :
LhiXYbh LcW]MhYW\h]hWU]b U MYW\b]WU` t+Bb[M]KbYAYAf@Bj]CN<cKf gY
ODA &\$%* , IAME?=J 9K?EAOT KB /JCEJAAMEJC /@P?=OEKJ ,JJP
/ - .46
R0 4Sb]hYX GUh]cbg ' /- .2(+ KYgc`ih]cb 4- ,.7 MfUb gZcfa]b[] ci
gighU]bUV`Y XYjY`cdaYbh+
R0 SC+U`XUoUM\Y <cX]b[] FUb iU` Zcf JiU`]hUh]jY KYgYUfW\Yfg+t
R0 6S <\UfaU+nKJNDMP?OEJC IMKPJ@A@ :DAKMT+ , 6M=?OE?=H IPE@A C
, J=HTNEN\$+ EcbXcb 8 M\cigUbX HU_g) <U`]Z7 LU[Y IiV`]WUh
Rl SP+ ?Ui`_bYf) s=iU`]gag) A]YfUfW\]Yg UbX @YbZYf]b >b[]bY
LW]YbWY) j e`2)0 d4+6/4)26/ - - - +
Rl SL<`UigYHbU` sIU]b UbX @U]b7 VUff]Yfg UbXg cW]hcfYWbh]hWY`g Z
h\]b_]b[]]bh c X]jYfgY YBb[M]KbYAYAf@Bj]CN<cKf gODA t&\$%* , IAME?=
/JCEJAAMEJC /@P?=OEKJ ,JJP=H -KJBAMAJ?A =J@ /SLKNEOEKJ!

&AA7?6;G% *@5EC +B@EA /E7CD;@?C

.A P\Uh gWcfY cb U gWU`Y Zfca . hc . - - k]h\ . - - VY]b[h
WcifgY UbX . VY]b[h\Y `YUgh igYZi` ibXYf[fUXiUhY Wc
WcifgY9

UAMY`` ig acfY UVcih k\Uh]adUWhg h\Uh gWcfY9 'P\Uh
Wcbg]XYf k\Yb XYhYfa]b]b[h\Uh gWcfY9(

/A AUjY mci \YUfX gh[W]dh\YW\gY]WU` Yb[]bYYf]b[t dfYj]cig`m

UAAUjY mci \YUfX]h]@>hG.Yl Wc,bh>@Ch/ -cZ,>'@0\$Uh
UVcih mcif ch\Yf Yb[]bYYf]b[W`UggYg9

VAP\Uh XcYg]h aYUb hc mci9

0A MY`` aY gcaY kcfXg cf d\fUgYg h\Uh XYgWf]VY k\Uh mci
h\]b_) UbX VY`]YjY+

1A =c mci]XYbh]Zm Ug Ub Yb[]bYYf9 P\m cf k\m bch9

2A P\Uh jU`iYg cfc Uthchi]h\icXXg h\Uh]bZ`iYbWY mcif]XYbh]hm
Ub Yb[]bYYf9

3A P\Uh X]X mci `YUfX]b- mcH>@G/ - - ,>'G@0\$BgY) k\]W\ mci
X]X bch dfYj]cig`m _bck) fY[UfX]b[gcW]chYW\b]WU` Y`

4A Ack X]X]f>'G.1 - - ,F>@G/ - - ,>'G@0\$BfiWhh fYW\b]WYdh cZ
gcW]chYW\b]WU` Yb[]bYYf]b[9

UAP\Uh Wci`X mcif]bghfiWhcf \UjY XcbY hc VYhhYf dfY
Wcbg]XYf gcW]chYW\b]WU` Y`YaYbhg cZ Yb[]bYYf]b[9

5A Ack UddfYd]U]h Zcf Yb[]bYYf]b[dfcZYggcfcg hc hYUW\
hYW\b]WU` Yb[]bYYf]b[WcifgYg9

6A Ack Uddfcdf]UhY]g]h Zcf dfUWh]W]b[Yb[]bYYfg hc Wc
k\Yb XYg][b]b[Yb[]bYYf]b[gc`ih]cbg9