



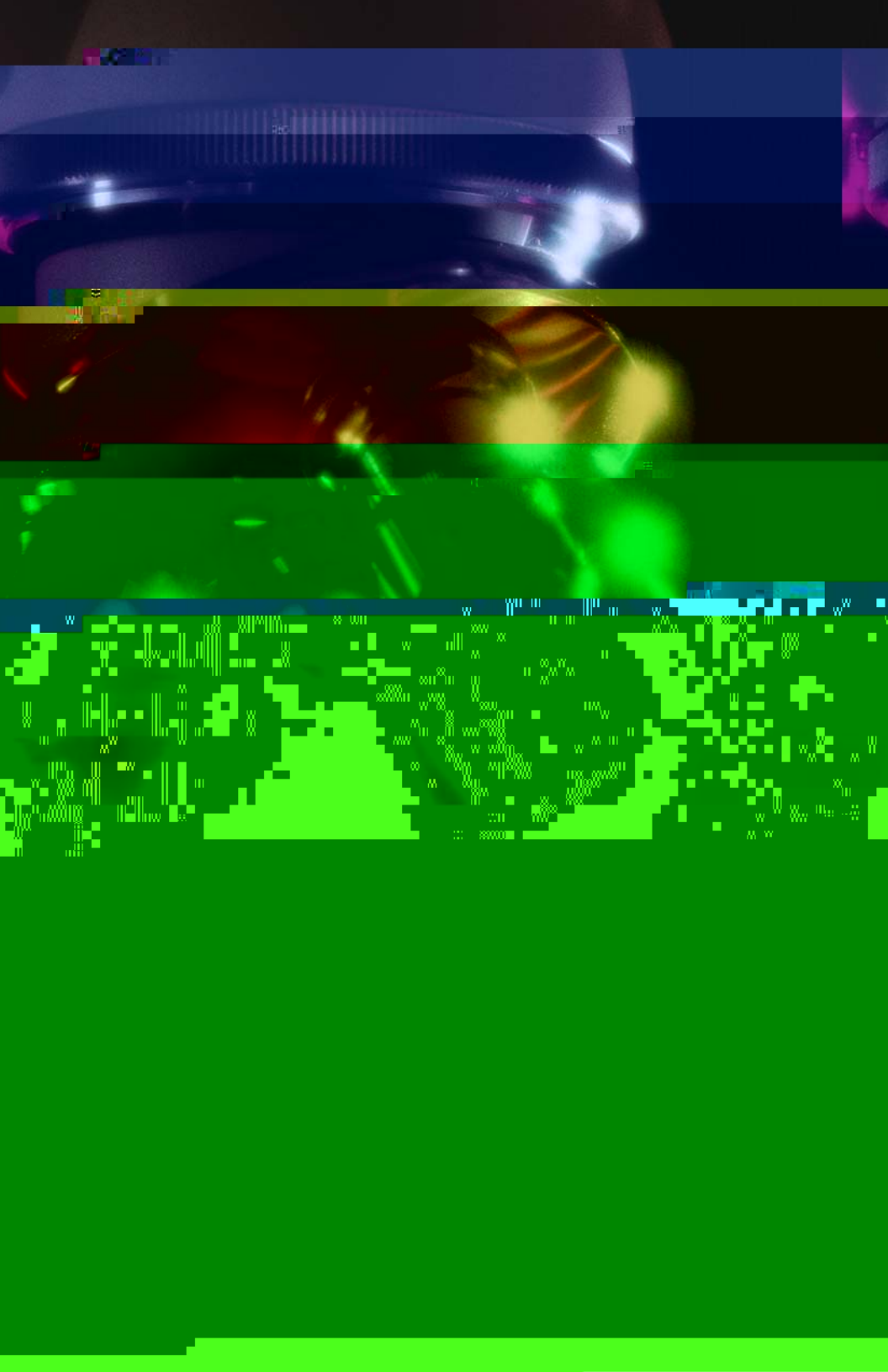
National Science Foundation
WHERE DISCOVERIES BEGIN

Baylor
College
of
Medicine



NSF HRD-0080662

Ga e R. Sa g e , P .D.



INTRODUCTION



This is the most exciting time in history to become a scientist or engineer. Our imagination is often our limit to what we can discover or do. Our achievements enhance the world around us at a dizzying pace. New diagnostic tools, medicines, new materials including those made by nanotechnology, miraculous computers, lasers and electronic devices are transforming our world. But America is not producing enough scientists and engineers to maintain our position as world leaders in science and engineering. Many factors affect the number of Americans entering STEM (science, technology, engineering and mathematics) fields. Numerous studies have emphasized the importance of attracting STEM professionals from every group in the country. We cannot afford to lose the talents of women, of African Americans, Hispanics, Native Americans, or those with physical challenges. In fact, we can't afford to lose the talents of any Americans who could become STEM professionals. We must use a variety of strategies to help people with the desire, intellectual ability, creativity and perseverance to continue to gain the education to become the next generation of leaders in STEM. A number of programs provide opportunities for undergraduates to conduct research or gain practical real life experiences. Graduate schools and organizations provide salaries or stipends to support advanced level study, especially at the Ph.D. level.



Some of you have access to people who can guide you through the process of applying to graduate school. However, many people using this book may not feel they have sufficient guidance to move to the next level of their education. A lot of people in STEM careers do not come from families with a history of advanced education. Some of the outstanding Ph.D. students at my institution are first generation high school graduates.

This guidebook has been developed to help undergraduates understand and prepare for entering graduate school in the sciences or engineering. The elements presented here have been developed over the past 17 years that I have worked with undergraduates, Ph.D. students and post-doctoral fellows through the Graduate School of Biomedical Sciences of Baylor College of Medicine. The undergraduate majors of my students have spanned the spectrum of STEM, including biology, chemistry, computer science, engineering, mathematics, physics and every other imaginable area. Like research projects, this material has evolved - from pointers provided to puzzled students into more formal workshops, many of which have been presented a



number of times. Thanks to funding from the National Science Foundation (NSF HRD 9906394), these pointers have been assembled into a guide that I hope will make it easier for students to apply to and be accepted by the graduate school of their choice. The guidebook includes several sections, each useful at a different point in your education. You may come back to different sections at different times. Some sections refer you to other specialized resources.

The first section provides pointers on making the most of undergraduate research and work experiences. I've worked with more than 1,600 students in our SMART summer undergraduate research program and helped many of them apply for Ph.D. programs. Practical, real-life experiences are prized by graduate school admissions committees. Hundreds of research/work opportunities are available for resourceful undergraduates, but you have to maximize the impact of your



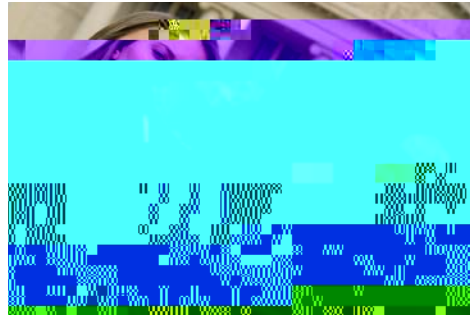
been a great challenge. Our guidebooks for students and faculty have been updated a number of times to keep pace with changes to the GRE. But the SMART Program and other campuses have demonstrated that students can improve their scores through workshops and individual study. Many students improved their scores by 200 points or more using the strategies outlined in this book. Our hope is that the information in this book will provide inspiration and guidance to help you do your best on the GRE and reach your career goals. But the moral of the story is that as scientists and engineers we learn to be problem solvers and you never know what problem you'll find yourself solving next.

One section of the book includes information from some of the "Thriving, Not Just Surviving, as a Scientist" skills workshops I present at BCM. In the early stages of my career, I spent a lot of time trying to find out how to do things right. As a scientist/educator I created a series of workshops to provide advice on developing the practical skills we need as scientists. The workshops that are of greatest relevance to undergraduates are included in this book. Hopefully, the pointers in this book will help you do a good job and save time and stress. We love science or engineering, but having a life is important, too.

I developed workshops on applying for graduate school for the undergraduates and technicians working at Baylor College of Medicine. Graduate schools are looking for American educated students who have taken good advantage of their opportunities and can relate their experiences and preparation in knowledgeable language. Understanding and preparing for the application process can reduce the stress you feel and result in greater opportunities to expand your knowledge and skills in the environment you chose.

Good luck as you continue your education. The lives of people around the world have been enriched through science and engineering. New discoveries and applications of knowledge will continue to develop – as long as we have people who are willing to gain the education and persevere to make today's dreams and crazy ideas, tomorrow's realities.

—Gae R. Saege, P.D.
 Asssa Dea of Gadae Edca o
 ga es@bc .ed



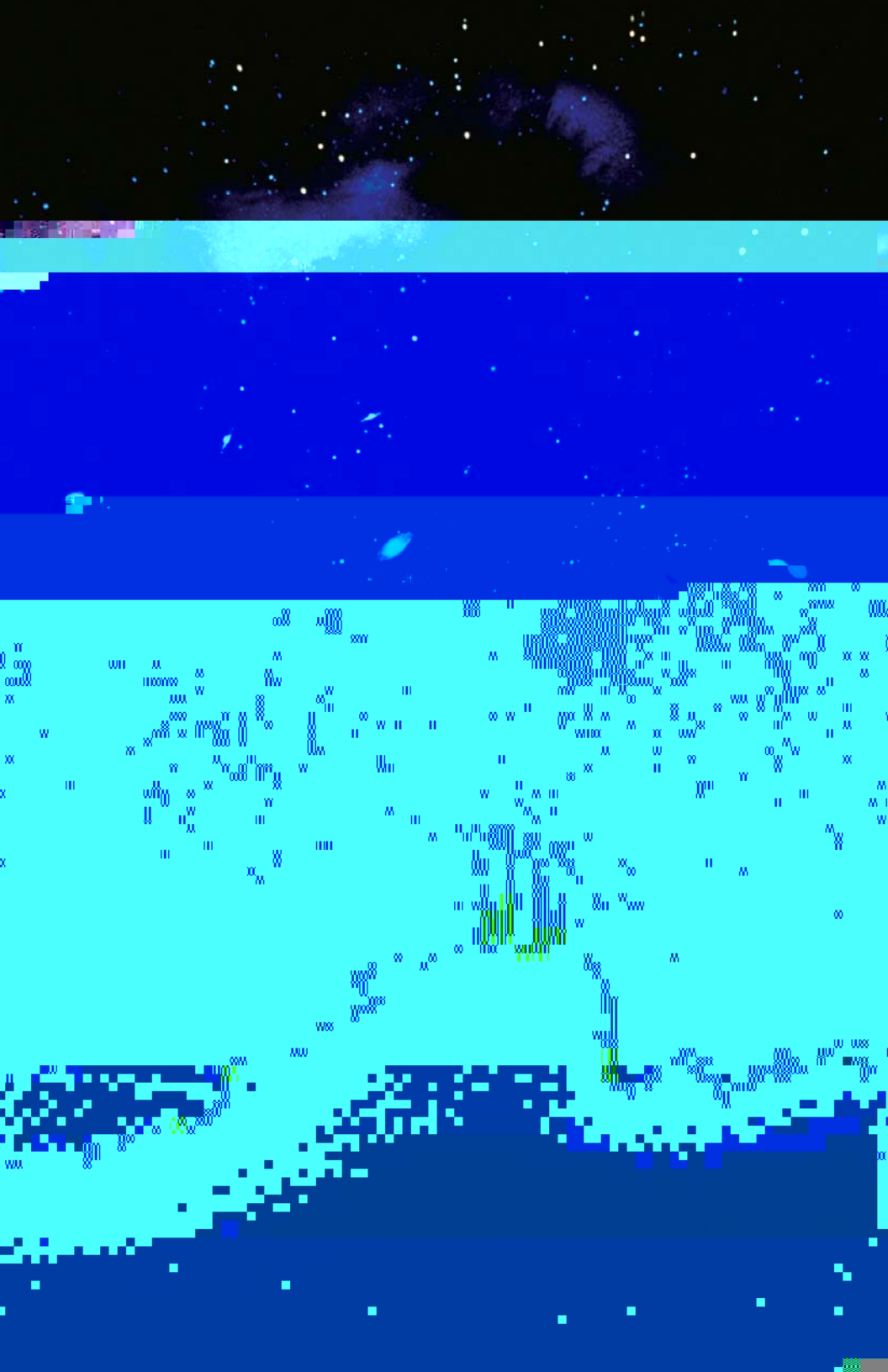


TABLE OF CONTENTS

¥ Lqh|k g^Mf \ | j j Y m M | J | k | Y | [^ O g j c G h h g j | n f d a k | 2

¥ 9 h h d f _ ^ g j K n e e | j J | k | Y | [^ O g j c H j g _ j Y e k | 2

¥ ; g e e n f a M a _ o a ^ H j g _ j Y e < a j | l g j k | 2

¥ ; ^ g g k f _ Y H j g | [l D Y Z | 3

¥ = p h | [M a g f k i g ^ J | k | Y | [^ H j g _ j Y e H j | a d h Y f l k | 3

¥ E Y c f _ l ^ | E g k | g ^ Q n j J | k | Y | [^ O g j c = p h | j a f | | 5

¥ > a Y d r a f _ Q n j O g j c | 5

¥ ; Y h a Y d r a f _ g f Q n j J | k | Y | [^ O g j c = p h | j a f | | 6

¥ ? | f | j Y d A ^ g j e M a g f ^ Y Z g n l ^ |] ? J = | 9

¥ J | Y k f k l g H j | h Y | [^ g j l ^] ? J = | 9

¥ O ^ M a k Y ? g g ^ \ ? J = K | g | 7 | (

¥ J | k g n j [| k l g @ | d h Q m H j | h Y | [^ g j l ^] ? J = | 1

¥ H j | h Y a f _ ^ g j l ^] ? J = | 1

¥ L ^] ; g e h n l j ^ 9 \ Y h l a | L j k l 2 ; 9 L | 3

¥ K l j M | _ a k l g ^ A h j g n | Q n j K | g | k | 4

¥ D g _ a ^ h j g Z d e k | 39

¥ M f \ | j k Y f a _ O ^ M a C a ^ g ^ J | d a g f k a n Q m O Y f l o a ^ Y E | f l g j | 59

¥ ? M ^ | j a f _ A ^ g j e M a g f l g ; ^ g g k | Y E | f l g j | 60

¥ 9 h h j g Y | a _ A ^ a a m Y k Y Z g n l E | f l g j k a n | 62

¥ O g j c a f _ = ^ | l a n d j o a ^ E | f l g j k | 65

¥ E g n a f _ 9 o Y q ^ j g e ^ E | f l g j a _ l ^ M : | | g e | k E | k q | 66

¥ J | k h g f k Z a d l q g ^ < M Y 9 | i n a k d a g f | 69

¥ K q k l | e k i g ^ < M Y 9 | i n a k d a g f | 69

¥ G j _ Y f a r a f _ Q n j D Y Z F g l | Z g g c | 70

¥ E Y c f _ ; g j | [l a g f k l g ^ D Y Z F g l | k | /*

¥ ? n a \ d f | k ^ g j ; g e h n l j J | [g j \ k | 72

¥ ; g f [| j f k J | _ Y \ a f _ ; g e h n l j J | [g j \ k | 73

¥ J | k n l k g ^ : Y \ J | [g j \ C] | h a f _ | / +

¥ C | q k l g J | d h Z d J | [g j \ C] | h a f _ | 73



¥?]f]jYdHgaf l]jk^gj '=^] [lan] J] Y\af_ ' 75
 ¥Dg[Yaf_ 'Hh]jk' 76
 ¥HhZd[Ylagf 'E ql` k' 76
 ¥J] Y\af_ 'GZh [lan]kJ] Y\af_ '9hhjgY[`]k' 77
 ¥9f Yd[r^af_ ; ge hgf] flkg^YK[a flā['Hh]j' 80

¥O` Y'akHY_ a]jke 7 83
 ¥9ngaf_ 'HY_ a]jke 83
 ¥E] [` Yf a k g^ ; aYlagf ' 83
 ¥ ; ge e gf I n] klagf kYZgnl ; aYlagf ' 84
 ¥LjYhk'lg'9ngaf_ a ; aYlagf ' 85

¥?]f]jYdHgaf l]jk

¥ Hf f a _ Qnj Hgklj 05

¥ Hgklj H] hY Yagf 06

¥ ; ge hY a _ Hgklj > gje Ylk 06

¥ H] k f l a _ Qnj Hgklj 07

¥ ?] f] j Yd Hg a l] j k ^ g j = ^ [] l a n] K h] Y c a _ 12

¥ ; ge e g f ; ge h g f] f l k g ^ K [a f l a b [H] k f l Y a g f k 12

¥ H] h Y a _ Y K [a f l a b [H] k f l Y a g f 13

¥ ; ^ Y Y [l] j a d a k g ^ = ^ [] l a n] K h] [^] k 13

¥ H] k f l Y a g f K c a d k 14

¥ E] f l Y d d H] h Y a _ ^ g j Y H] k f l Y a g f 15

¥ E]] l a _ G l] j K [a f l a d k = f _ a]] j k 17

¥ > a k l K l] h k L g o Y j \ Y K n [] k k n d 9 h h d] Y a g f 21

¥ ? j Y n M] K l ` g g d 9 h h d] Y a g f H M ` o Y q 22

¥ 9 h h d] Y a g f ; ge h g f] f l k 23

¥ O j a f _ H] j k g f Y d K Y] e] f l k * 24

¥ <] k j a z a _ J] k Y j [^ O g j c = p h] j a f [] 25

¥ H j h g k l ` g ^ ? j Y n M] K l ` g g d A l] j n a o k 29

¥ @] d h n d @ a l k ;] ^ g j] Q n j A l] j n a o 31

¥ @] d h n d @ a l k > g j A l] j n a o a _ 30

¥ G n] j [g e a _ K q f] k k a f Y f A l] j n a o K l l a f _ + 32

¥ K Y e h d A l] j n a o I n] k l a g f k 32

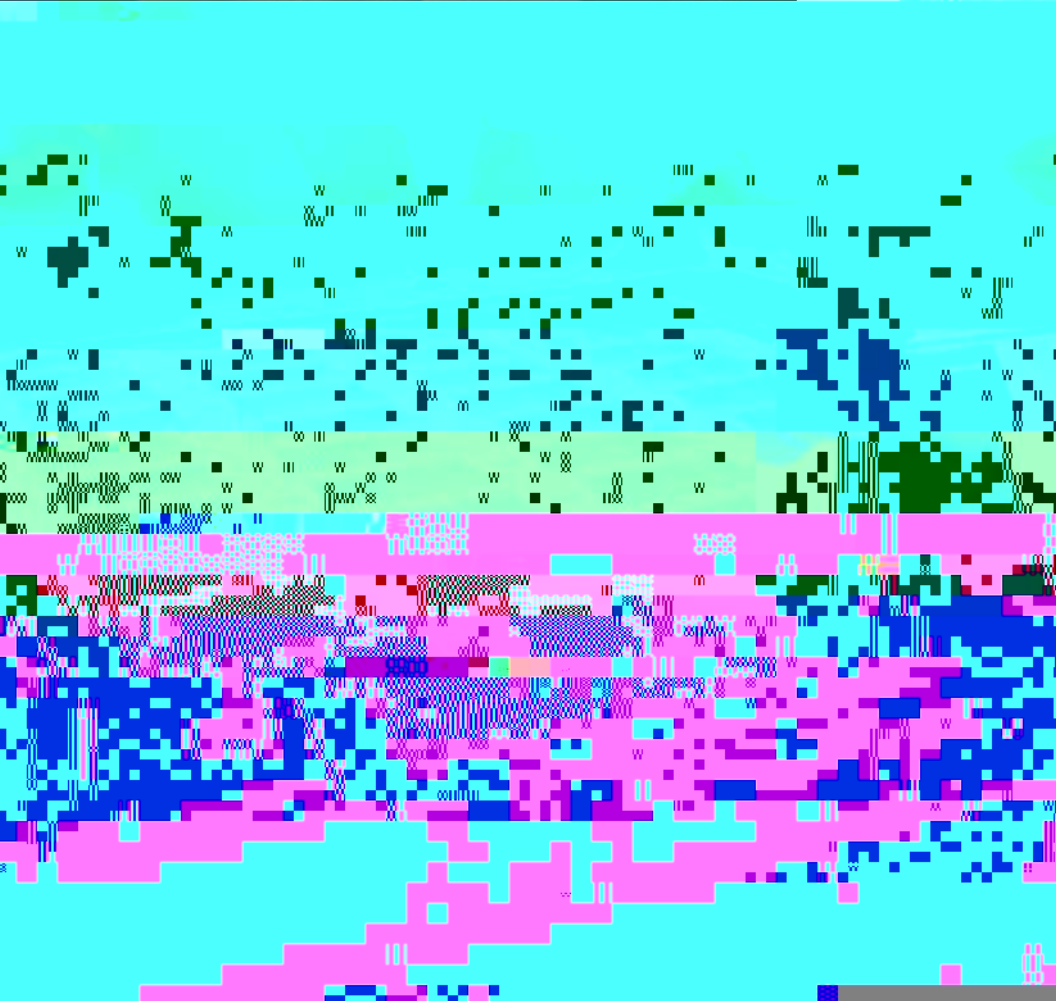
¥ K g [a d = n] f l k Y k Y H j] g ^ l] A l] j n a o 33

¥ O ` Y l g ` 9 n g a ` a A l] j n a o K a n Y a g f k 34

¥ @] d h n d @ a l k 9 l] j t] A l] j n a o 35

¥ J] k Y j [^ A l] j] k Y f \ = f n a j g f e] f l 37





Chapter One: Research and Work Experience

Hj]lā dhYlāf_āf j]k]Yj[`gjo g]caf_āf `l`]k]āf[]k]g]f_āf]jāf_ [Yf `Z] `gf] `g^`
 l`]e gk]j]o Y]āf_ Yf\]fjā`āf_]ph]jāf[]k]g^qgnj`nf\]j_Y\mM] [Yj]]j&L`]k`
]ph]jāf[]k]k[Yf`] dh`qgmā\ flāq`qgnj`kh] [āp] `āf]j] k]kYf\ [Yf`hjgnā\ `qgmio d`
 nYdhZd`cf go d_\` Yf\]ph]jāf[]l` Yl`o ad]h]hYj] `qgm`g`nj]]j` \m] Ylāgf`Yf\`
 Y[Yj]]j`āf`k]āf[]g]f_āf]jāf_ &E gk`_j_Y\mM] `k` ggdk]ph] [l`Yhdā Yf]klg` Yn`
 hjY[lā Yd] Ydā]ph]jāf[]āf`YdZg]Ylg]q]g]f_āf]jāf_`k]llāf_&

• • • • • /v

L`] km] fl`_f]j]Yd]l] Ye km]o d` Y`Y[nd]q`e]e Z]j`jge`]j` āk]k` ggdYf`
 o g]ck]gf`Yf`Yd] Yāq] pāāf_`hjgh] [l&Mf`d`k]l`] km] fl`_ Yk[`gk]f`lg`ngdh]l]]j`
 `ā`]j`lā]Sl`] km] fl`ā`d`]j` [ge`h]f`kM] \`e`gf] lY]ā]g]o`ā` [d]k]k]j] \d&
 Kge] [gd]_]kYf`nf`an]j]k]ā`k` Yn`]p] [d]fl]j]k]Yj[`hjg_jYe`k]khgf`k]g] \`Zq]g]`
 _Yf`ā`Ylāgf`k]ā`]` F`Ylāgf`Yd]k]āf[] `>gnf`Ylāgf`Sg] F`Ylāgf`Yd]ā`klān]k]g^@] Yd`S
 l`] E [F`Yā`H]g_jYe`Sg]]j`_gn]j]f`e]f]lYdY_]f[ā`k]g]h]jān]]g_jYf`ā`Ylāgf`k]ā`]`
 @go`Y] \`m`]kE] \ā`Yd]ā`klān]]g]l`] K]Yf`>gnf`Ylāgf`&Kge] `hjg_jYe`k]g^j]
 k] `gd]k`ā`k]g]l` gk]o`g`hY]lā`dhY] `āf`j]k]Yj[`hjg_jYe`k&

=f_āf]jāf_`km] fl`k`e`Yq`hY]lā`dhY] `āf` [g]gh`hjg_jYe`kl`Yl`hd]l`]l`]e`āf`]f_ā`
 f]j]āf_`p]e`k`g]l`]`kne`e]j`g] `njāf_`l`] Y[Y]e`ā`q] Yj&L`]k]]ph]jāf[]k]gh]f`
 \gg]o`Yq]k]g`lg`Zk]g]hjgnā\]j] [ge`e]f`Ylāgf`k`g] `nj]]j` km]q&

H`&`&Y`e`ā`k]āf`k] [ge`e`dl]]k]ph] [l`nf`]j_Y\mM] k]g]kh]f`k]ge] `g^l`]ā`lā]`
 [gf`n]lā`_j]k]Yj[`āf`l`]`kne`e]j]k&nf`]j` \k]g^j]k]Yj[`hjg_jYe`k]Y] YnYd]Zd`
 Yl`g^k]ā`āf`klān]lāgf`k]āf` [dh]āf_`nf`an]j]k]ā`k]S_j_Y\mM] `k` ggdk]S`_gn]j]f`e]f]āf`klān`
 lāgf`k]Sāf`n]k]j]ā`dg]f]f_āf]jāf_`k]llāf`k&

Kne`e]j`hjg_jYe`k]Y]]g]l]f`hYā`hg]k]āf`k]SYf`k]ge]lā]k]g^j]Y` [ge`Zā`Ylāgf`
 g^j]k]Yj[`]`d] \`k]e`āf`Y]k]S`ā`k]n]k]āf`_j]gn]k]S`k]ā`k]o`g]ck]gh]k]S]l]k]h]hY]Ylāgf`
 [d]k]k]k]SYf`_g]_Yf`ā`]k]g[ā`dY]lā`d]ā`k



..xk a t ' n . , ' .

) & ?] 'af 'gje Ylagf 'gf 'YnYjaj lq'g'hjg_jYe kSaf [dñaf _ 'hjg_jYe k'af 'k'llaf _k' o `] j 'qgmie a ` l 'Yhhdq'lg' _jY'nMl] k' `gg&J] kgnj [] k'qgmie a ` l ['gf kno' Yj] 'hjg'] k'gj kSY [Y] e a ' Y'ndgj kSh] j kYf \ ` o] Zka] k'ac] t'] 'g'dgo a f _2

- <http://www.aamc.org/members/great>
- <http://www.ASCB.org>
- <http://www.NSF.gov>
- <http://www.SACNAS.org>
- <http://www.yale.edu/necuse/>



* & ; j] Yl] 'Ykhj] Y'k]] l' o a ` 'af 'gje Ylagf 'YZgm' hjg_jYe k&E Yl [` 'qgmj k' d'lg' hjg_jYe kS \] h] f \ a f _ ' gf 'qgmj] j] k] Yj [` ' o gjc ' a f l] j] k'kSlqh] 'g'hjg_jYe S Y [lada k'g'] j] \ ' Yf \ t'] ' q'g] Ylagf & L ` \ a'] j] f [] k' a f ' e gf] q'g'] j] \ ` a d f] gl' e Yll] 'g] n] j] lae] & ` 'gk' hjg_jYe k'ZYk] \ 'gf ` go t'] q'e]] l' 'qgmj' f]] \ k& +& 'KnZe d Y'de Yl] j a' d' k' z' g'] f ' a f [dñ] k] j Yf k] j a h k S d] % l] j k'g'] j] [ge e] f \ Ylagf Sk'at k] n'Ych'Ylagf kS] k'k'qk' Z] 'g] t'] \] Y'df] & A' d' a' k' a' e h'gk' z' d] 'g' 'knZe d' a f 'gje Ylagf 'Z] 'g] t'] \] Y'df] S] e Yad] '] 'hjg_jYe \ a] [l'g] S] ph'daf t'] 'k' m' Ylagf 'Yf \ j] i n] k' Y'dl] ' knZe a'k'agf &

, & = e h' Yka' 'qgmj] j] k] Yj [` ' a f l] j] k'kS] ph] j a f [] SYf \ a f l] d] [l n'Y'daf ngd] e] f l S f] g] [ge e n f a q' k] j n d] 'g] [dñ] a f ngd] e] f l & A' qgm' Yn] ` Y] j] d n'Y l] j] % k] Yj [` ' o gjc] ph] j a f [] S \] k] j a Z] a'] '] [l a n] d] k] ; ; ` Yh] j] , S C x] k] j a Z a f _ J] k] Yj [` ' = ph] j a f [] O & Kge] 'hjg_jYe k'e Yq'Yk' 'qgmilg' \ a d] n'k'qgmj] j] k] Yj [` ' a f l] j] k'k&J] Y' YZgm' Yj] Yk' a f ' o ` a ` 'qgm' Yj] ' a f l] j] k] \ ' Yf \ d] l] t'] j] n a] o] j] ' cf go 'qgm' Yn] 'kge] 'Ye a d] j a d] o a ` kh] [a p] l'gha k&O] j a] ' e g] t' Yf 'Y' [g n h d] g' a k] f l] f [] k &

' - & > g'dgo a h'lg'Z] 'knj] 'Yd'qgmj' e Yl] j a' d' k' Yj] a n] \ & = e Yad k' n'k'Y'dd] t'] Z] k' o Yq'lg' [ge e n f a Yl] o a ` 'hjg_jYe 'k'Y' So ` g' Yj] ' e g] d c] d] t' Yf t'] \ a] [l'g] l'g' cf go 'a'qgmj' P d] a k] [ge h d]] &

f a t . t . t . t v t ' n . , ' .

J] k] Yj [` 'hjg_jYe \ a] [l'g] k] Yj] 'Znkq' h] ghd S Z m] t'] q' Yj] ' a f l] j] k] \ ' a f 'qgm' Yf \ ' Yj] ' l'qh] Y'dd] o a d f _ l'g'] d' 'qgmio d' ' a k' n] k] t' Yj] i n a] t'] a]] ph] j] l a k] & @ go [Yf ' qgmighlae a] 'qgmj' a f l] j] Y] l a g f ' o a ` ' Yhjg_jYe \ a] [l'g] 7



·) & ·

4. . h. r)&

U.S. Department of Energy

-) & O g j c ' o d ' t '] h j g _ j Y e ' \ a j] [l g j j] _ Y \ a f _ ' d Z \ l g Z h d [] e] f l &
- * & ; '] [c ' g m i ' Y [n d q] h j g b] [l k Y f \ h j g n a] j] i n] k l g ' o g j c ' a f ' k] n] j Y d ' d Z k g ' Y] Y k &
- + & J] [g _ f a r] t ' Y l f g l] n] j q k l m] f l _] l k '] j ' a k h j] \ j j] \ [' g a] & G \ l f t '] ' e g k l] p h] a f [] \ k m] f l k o a d l] t '] a j ' P j k [' \ g a] & L y c] Y n Y f I Y _] ' g ^ t '] ' k a n Y l a g f ' q m Y] ' g ^ j] \ l g ' Z n a d ' q g n j ' c f g o d \ _] ' Y f \ ' k a d k S k g ' q g m i o a d l Z] h j] h Y] \ l g ' Z] h d [] \ a f ' q g n j ' P j k [' \ g a] h g k l a g f ' a f t '] ' n i n j] &
- , & < g f O Y [] [h l ' Y h g k l a g f ' a ' q g m i [Y f O e Y c] Y [g e e d e] f l l g ' _ a] ' a ' q g n j ' Z] k l ' ^ g j] &
- & C]] h Y d l [g j] k h g f \] f [] ' o a d ' q g n j ' h j g _ j Y e ' Y f \ [g f I Y [l ' q g n j ' e] f l g j ' Z] ' g j] ' q g m i k Y l] ' g f ' ' g o ' q g m i [Y f ' h j] h Y] ' l g ' Z] ' Y k k n i [] [k k n d Y k h g k k e Z d] &
- . & J] Y ' Z Y [c _ j g n f \ ' e Y] j a d g f ' q g n j ' h j g b] [l Y f \ l j q l g j] Y ' Y f q h Y h] j k l '] ' ' d Z _ j g n h ' Y k h n Z d k] \ & = n] f ' a ' q g m \ g f O n f \] j k Y f \] n] j q l ' a f _ S q g m i o a d l _ Y f ' k g e] ' c f g o d \ _] &
- / & D j Y f ' ' g o l g ' o g j c ' o d ' ' q g n j ' e] f l g j z k l ' Z q j] \ j j f a ' l g t '] ' ' a l k g f ' E Y c a f _ t '] ' E g k l g ^ E] f l g j ' J] d l a g f k a k a f [' Y h l] j ' g n j & g e e n f a Y l] ' o a d ' q g n j ' e] f l g j ' Y f \ h j g _ j Y e ' \ a j] [l g j ' g l] f &
- 0 & H q Y l l] f l a g f ' \ n j a f _ l j Y a f a _ S Y k i n] k l a g f k Y f \ l Y c] f g l] k &
- 1 & C]] h _ g g \ j] [g j \ k g ^ q g n j ' o g j c 2 d Z f g l] Z g g c k S f g l] k S l g n j f Y d k &
-) (& : m _] l l a e] ' o] d Y f \ n k] ' a ' o a k] d a f l] j f k a k Y j] ' n k n Y d d] n] j q k ' g j l l] j e & M k] ' O Y a O l a e] l g ' n h \ Y l] ' q g n j j] [g j \ k S j] Y h Y h] j k S g j h d f ' '] p h] j a e] f l k o g j c &
-) & H Y f ' Y f \ ' g j _ Y f a r] ' q g n j j] k] Y j [' Y f \] p l j Y [n j a d n d j Y l a n d a k Y f \ l Y c] ' ' Y n Y f I Y _] ' g ^ o ' Y ' a k g ^ j] \ l g ' q g n &
- * & :] Y l] Y e ' h d q] j S j] k h] [l g l '] j k S j] [g _ f a r] t '] a j ' [g f l j a Z n l a g f k ' l g t '] ' h j g b] l &

U.S. Department of Energy

-) & :] k n j] ' q g m n f \] k l Y f \ ' Z g l ' t '] ' k g j l %] j e ' Y f \ ' q g f _ l] j e ' _ g Y d k g ^ ' t '] ' h j g b] l &
- * & K n e e Y a r] ' q g n j ' o g j c ' a f ' o j d l] f ' Y f \ ' g j Y d ' g j e k S a f [d n a f _ ' g n] j Y d l _ g Y d k S q g n j _ g Y d k S q g n j ' o g j c S l '] j] k n d k Y f \ ' a k a e h d l Y l a g f k & L ' a k o

· - & J][g_fa]l`Yl'qgmY] `d Yf af _` go `lg`^g`j]k] Y] [`o gjcSYf \l` Yl'o` ad`
qgmY] [gf ljZmf _lg'l`] h]g] [lSqgme Yqf gl [gf ljZmf] f gm` lg'Zl`
Yf `Ym` gj`gf hgl]jk`gj`hYh]jk&

· .t M u .x r t . /v i . y . l . .

·) & C]]h`Yp`d`gf`l`Yl`j]k] Y] [`o gjc`l`ph]j`af`[]`o`d` `Y[ghq`g`^`qgm]`
Yh`d`l`Y`agf` `Yf` `Ykne` e` Yj`q`g`^`o` `Yl`qgm`l`a` `Yf` `d` Yf] \ `znk] l`]`
YZkjY[l`qgmio`jgl]!&

· * & M] `o` `Yl`qgm]d` Yf] \ l` jgm` l`] `af]]j`f`k` ahk`af` [d]k`\$af` \`d`[m



Chapter Two: Doing Your Best on the GRE

L'] ? J = 'kYklYf \Yj \a' \] pYe f Ylagf 'Ye f ad] j] \ 'Zq' =LK' z= \n] Ylagf YdL] klaf _ K] jnd] ! &] [Ynk] _jY \nM] 'k' ` ggdyhhcd] Yf lkOe YtgjkS [gnjk] kSk' ` ggds \aP [ndq' Yf \ [nj] f [q' g^ [gnjk] knY] qSkge] _jY \nM] 'k' ` ggdkj] d] gf ? J = 'k] g]] kYk'] 'gf d] \Y Yo d' 'Y [gf kkl] f l' k] Yd & O ` ad ? J = 'k] g]] k' 'Yn] 'Y de ad] \ 'hj] \ a] lan] 'nYdn] 'af' a] f latqf _lYd f l] \ 'k] a] f ldkk g]] f _f]] jkSkge] _jY \nM] 'k' ` ggdknk] 'qgnj k] g]] k' lg'e Yc] \] [dkgf kj] _Y] \ a' _k] d] [lagf 'g^ knn] f lk&L'] 'o] a' _l' _an] f 'lg' qgnj k] g]] k' nY] a] kZ] lo]] f 'k' ` ggdkSkge' a' o' gmn] 'Z] 'Z] f] P [ad] lg' [gf lY] l' hj_g] Ye 'Ye f ad] Y% lgjk \ a]] [lgjk g] 'Ye adkgf k' g' P [] jkYf \ 'af i n]] 'YZgnl'] ' 'ae hgi] Yf [] 'g^]] ? J = 'af'] 'k] d] [lagf 'hjg [] k&A' k' Ydg' nYdn] YZd' 'gj' qgmilg' Z] 'Ye ad] 'o d'] ']] pYe 'Yf \ 'cf go' go' qgmie a' _l' ae hjgn] 'qgnj k] g]] &

h. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

L'] ? J = 'o] Zkd] 'z llh2' o o o & j] & g] _l' [gf lYaf kYq] l' g^ nk] 'ndaf' 'gje Ylagf 'YZgnl'] ']] klSaf [d] \ a' _l'] ' [gkSl'] 'ghhgjlnf d] q] lg]] _ad] j' 'gj'] ']] kl' Yf \ 'af' 'gje Ylagf' 'gf' 'Yi n] a] f _j]] kgnj []] klg' hj]] hY]] 'gj'] '] ? J = &

- ¥ L']] pYe 'ak' _an] f 'q] Y] gmf \ 3]] klaf _ []] f l] jkY]] 'ad] \ 'gf'] '] 'o] Zkd] ']
- ¥ L']] pYe 'ak' Ye f ad] j] \ 'gf' 'Y [g hml] j&E g]] 'YZgnl'] 'ak' d]] j]
- ¥ ; nj] f l d] 'qgmie Yq] lYc]] ']]] kl' gf [] 'Ye gf] ' \$mh' lg' - 'lae] kYq] Y] &
- ¥ Qgnj []] an] 'qgnj k] g]] k' gf] '] n] jZYdYf \ 'i nYf l d] Ylan] 'k] [lagf kae e] \ a% Y] d] Y^ A A



? J=ng[YZndj q'o adZ] Yhhcd YZd lg'd Yjf a_f] o k'af lae l] je f gq%
_q&L`] f] o ng[YZndj q'qgmid Yjf 'o adle Yc] 'qgmYe gj]] ^ [la] 'ojd] j'
Yf \ kh] Yc] j'af _jY\mM] k' ggdf \ dM] j'af 'qgnj [Y]] j&D] Yjf a_f`
hj] [ak] 'df_mY_] lg[' `Y] Y[l] ja] h] gh'd 'o adZ] Yf Ykk] a' f 'ojdf`
] kYqk YZgm' qgnj k] d'zh] jkgf YdkY] e] fl! Sgj] n] f 'ojdf` _d] ll] jkg^
j] [ge e] f \ Ylagf 'kge] \ Yq&

Y . k n t . . k . t . . 4 . 4 x . a . . k . t . n . . k

O`q'o gnd Yk[af lae] g] j'f _f]] j'Z] f] Pl'jge] phYf \af _t] a'ngl YZndj q'lg'
af [dth] 'og] k'l' Yl'Y] 'e gj] 'Ye adnj lg'Yf =f`_dk' g] kg[agq`q'e Yhg 79 H & &k'
f gl Yl] ['f a' Yd \ _j]] &A \] f gl] k'l'] ` a`] k' d' n] dg^'gje Yd] n'f Ylagf &9f \ 'qgm
f] n] j'cf go `o`] j] 'Yf] \ n'f Ylagf 'o adq Y' qgn' & Qme a` _l Z] [ge] 'Y'Y] n'q'e] e %
Z] j] S] n] f 't'] \] Yf 'g^Y` _j Y\mM] k' ggdf` Ynf a] j] kq Yf \ f]] \ lg'af l] j] Yl' o a`
h] gh'd 'jge 'e Yf q' a'] j] f l' \ h] Y] e] f l' k'o` g' kh] Yc' Y' a'] j] f l' 'df_mY_] Ol' Yf 't' Y'
lqh' Ydth nk] \ Zq] k' af lae k' g] j'f _f]] jk&

? jgo af`_nh'af`_t] J'ag? jYf \] NYd] q'g^L] pYkSj a' Y' \ LYha' SH & & f] n] j'ae Y`%
af \ t' Y'] 'o gnd Z] [ge] 'Yo gjd` 'Ye gnk'e Yl'] e Yl'af' Yf \ Z] 'Yhgf l] \ lg'
f Ylagf Yd] [ge e dl]] k'l' Yl' k'nq] \ n'f Ylagf 'g^e Yl'] e Yl'af' kS] f _f]] jk Yf \ k'af %
lae k&@ak[gd] Y_n] kkh] Yc' Yf] \ n'f Yl] \ df_mY_] SYk'g'e Yf q'h] gh'd'af`_d Y] jk' ah'
hgk'agf k&

=f ja`_af`_e q'ng[YZndj q'Z] [Ye] h] jkgf Ydlg'e] t'] \ Yq'l' Yl' Ao Yk] g'hj] k] f l' Y'
lYc' 'gje] e Z] jkg^t] F Ylagf Yd9 [Y] e q'g^K] af [] k&AY] ja] \ n] j] q'Yd] S] g] Yd'
t' Yl'] [ge e dl]] 'e] e Z] jk'af na] \ 'e] lg` Yn] 'df [`o a`_t] e &A'o Yk' O'qf`_`
Z] 'g] 'a'o Yk[d'Y] t' Yl'] [gf n] jk Ylagf 'kgnf \] \ dc] 'O` J=k] O'af gl' gf d] n'f] j%
kgg\ t' gk]] jm] a] 'd Y] jkSA] gnd hY] la' ahY] 'af`_t] \ ak' n'k'agf 'Z] [Ynk] 'A' Y' Z]] f`
'] dhf`_k'm] f l' k' Zna' t'] a'ngl YZndj q& Yf 'qgnia' Y_] `go 'f] jngnk' Ao gnd` Yn]`
Z]] f `o`] f `a'o Yk] lae] lg'hj] k] f l' e q'lYc' a' A' Y' Z]] f `af lae ahY] \ Zq'l'] dhf [``
[gf n] jk Ylagf 7L'] lYc' o Yk] n] j'q'o] d] j] [] an] \ Yf \ Ad Yjf \ Yf gl'] j' d' k' g' f `af`_t]`
nYdh] g^_] f] j Yd'cf go d \ _] &

Y . k n t . . k . t . . 4 . 4 x . a . . k . t . n . . k

- Y` - (#'gf`_t] 'af`_na' n'Ydi n'Yf la' Ylan] 'Yf \ t'] n] jZYdk] [lagf k`
Y]] _gg\ k] g]] k
- Y` , &% 'af`_ojdf`_ak Y`_gg\ k] g]]
- Y` / ((#'af`_Yl' `Y]] YSl'] i n'Yf la' Ylan] 'Yf \ t'] n] jZYd'ak Y`_j] Yl' k] g]] &
- Y` - % 'af`_ojdf`_ak Y`_j] Yl' k] g]] &
- L'] k] g] af`_k] Yd] ko adl [`Yf _] 'af`_G [lgZ] jS* ((. &



9f b d Y? gfrYdr'o YkYf '9j d Yf '9e]j d Yf '@ d h Yf d 'o ge Yf ']f _ d]]j d _ 'e Y%
lgj 'Yl MY 'KlY] 'Mf an] j k d q o `] f k] 'kYo 'Y B q] j 'Y n] j l k d _ '1'] 'KE 9JL 'Hj g_j Ye`
Yf \ \] [a] \ ' d k g n f \ \ ' f l] j] k l a _ & K] ' g n f \ \] j ' h d [] ' f ' k d f [] '1' 'Yl k n e e] j S
m k a _ `] j '] f _ d]] j d _ ' k a d k l g ' Yf k o] j ' Z a g d _ d ' Y d i m] k l a g f k & @] j ' Y h h d] Y a g f ' l g`
: ; E @ Kljn] l n j Y d Yf \ ` ; ge h n i Y a g f Y d : a g d _ q ' Yf \ E g d [n d j] : a g h ` q k d k H & &
Hj g_j Ye ` o Y k l j g f _ & L `] [g e e d l]] ` o Y k] k h] [a d d] a e h j] k k \ ` o d ` `] j ? J = k [g j] k S
o ` d ` ` Y j a d f ' k a f d [Yf l d j Y l] j ' h y] l a d h Y a f _
d '1'] 'KE 9JL? J = H j] h O g j c k` g h k & 9 f b d Y`
o Y k f g l ' g f d j Y e d l] \ S k] ` o Y k O [[] h l] \ O
Z q l '] ' Y [n d q ' Y k Y l g h [Yf \ a Y] & L `] n f a m]`
d l] % f k l a n l a g f Y d f Y n j] ' g ^ l '] K : E : ' H j g_j Ye`
Yf \ ']] Y _] j f] k k o d ` ` o ` d ` ` Y [n d q j] [j n a] \ `
`] j S [g f n a f [] \ ` Yf \ \ R ` q f Y a g f l` A A A

¥ Qgm[Yf f gl kch i n] klaf k&= de f Yl] Yf ko] jk l` Yl` qgm[Yf S`
_n] k'af] dh] f lq&

¥ Qgm[Yf f gl] Yc] [Yd n d] gk'af lg l`] l] kl&

¥ Qgm[Yf f gl] Yc] hYh] j`af lg l`] l] kl&

¥ L`] l] klaf`] [f l] j`o ad] hjgn`] qgmio d` k] jYl[` hYh] j&

¥ Qmie Yq'o ja] Yf ql` af` qgm[Yf] e] e Z] j`gf` qgmj k] jYl[` hYh] jS`
] n] f` Z] `g] l`] l] kl Z] _af k'Zg]] pYe hd Se Yl` `gje n d] k'g
g^ki nY]] jgg] kl&

¥ Qgm k` gnd k] l` nh Yf ne Z] jaf` k`] e] `gf` qgmj hYh] j`kg l` Yl` qgm[Yf`
c]] h] jYl[c] g^Yf ko] jk qgm] de f Yl] `g] o ja] \ go f` c] q'o g] k` jge l`]`
j] Yaf` hYkY] k&

¥ Qmie nkl lmf` af` qgmj k] jYl[` hYh] j`o`] f` qgm] P f ak` l`]] pYe &
L`] ? J = o ad] kl ad] Z] _a] f` gf` Y[ge hml] jaf` * ((. SZml`] ; 9L` o ad] Z] j] %
hd [] \ Zq` Yl] kl` o`] j]] n] j qgf] _] lkl`] `kYe] i n] klaf k&

¥ Kf [] =LK [` Yf _] kl`] ? J =`
YZgm] n] j q` lo g` q] Yk Sl`] Z] k] k] jYl] _q` k` lg` g[nk` gf` Zn ad` af` _] f] j Yd kca d] k'gf`
] f` Yf [af` _ng] [YZnd] qS]] Yaf` _ [ge hj] `] f` kagf Sg` _af Ydl` af` ca` _Se Yl`] e Yaf` Yd
[ge hY] agf kSaf] jhj]] laf` _ jYh` kYf` \ [gf kl] n]] laf` _ qg` _af Yd] kYqk&

) & Mkl` af` gje Yagf` jge` o] Z% ad] k2
http://www.gre.org: test information, PowerPrep, on-line diagnostics
http://ets.org/criterion/highered/: writing evaluation and advice.

* & Mkl` l`] j] kn d] k'g^ qgmj` \ af` gklaf`] pYe klg` g[nk` qgmj` kml` q] ^ g] jk'gf`
Yj] Yk'af` o` af` ` qgmY]] o] Yc] kl&

+ & ; j] Yl] `Yh] jkgf Yd kml` q` h d f S` g] nk` gf l`] `Yj] Yk'af` o` af` ` qgmif]] \`
e gkl` o gjc&

, & LYc] Yf` g` P] aYdh] h% g] njk] Sa` l`] hjaf`] ak` Y^ g] \ YZd &

- & Mkl` k] jYl] _af` kl` Yl` Pl` qgmj` ghlae Yde g`] g` d` Yj f af` _af` ana` mYd`
kml` qaf` _S` jgmh kml` qaf` _SBYk` % Y] \ kS]] l] &&

, & Mkl` e` n ad] d] j] na] o` Zggck` Yf` \ j] kgnj [] kSk` Yj]] j] kgnj [] ko d` ` jaf` \ k&

- & LYc] Yke` Yf` q` hj Y]] laf`] l] kkl` Yk` ^ Yk` Zd` Sa f [dml` af` _ kge] `gf` l`] [ge hml] j&

. & D] Yj f l`] `af`] [lagf k` g]] Yl` ` k] [lagf &

/ & D] Yj f` go` lg j] [g` f ar`] Yf ko] jk qgm[Yf] de f Yl]`

Z` Hgo] j` g^ = de f Yagf ! &

O & Lj Yaf` h` qkaf` Ydh` Yko] d] Yke] f] Yd k` qgmif]] \ lg` Zn ad` nh` qgmj` ZY [c` Yf` \`
f] [c` e` nk] d k & O Yd` Sg` _ Sko` ae` g] daf` o` a` lk` Zggck` g]] Yf` k` g^ ` gg` \`
e Yc] ` gg` \` d` l` o` a` lk&



1. 

L] [k]g] ʰ ʰj]i n] kʰ] ʰe gkʰ] pl] f \ \ læ] ʰlgʰæ hjgn] ʰkʰ] ʰn]jZYdk [g] &
 Ng [YZm]qʰkʰ] ʰ ʰ] ʰj]gʰ] ʰn]jZYdk [læf SkgÉ

1. 

) & J] n] a [o] Zggck ʰ Yn] dkk gʰ ʰ Yngja] ʰ o g] \ kÓ
 * & Qgmio adf gl Z] Ykc] \ ʰlgʰ_ an] \] P f dæg f kʰ gʰ o g] \ k & Qgmio adf g d f [] \ ʰlgʰ
 cf go] f gm ʰ YZgn] Y o g] \ ʰlgʰ nk] ʰ d' g]] dæ f Y] ʰ d Yk Y [ʰ g d]
 + & J] e] e Z] j Skge] ʰ o g] \ k ʰ Yn] ʰ e n d h d nk] k
 , & ? J = d c] k n f n k m y d o g] \ nk] k 3 l ʰ f c g m k a] ʰ] Zgp

2. 

) & E Yf q' o g] \ k Y]] [ge hgk] \ ʰ gʰ k d d Y Z d k' o d ʰ] f] j Y d e] Y f a _ k &
 * & D] Yf ʰ] ʰ] [gf f gl Yæg f gʰ o g] \ k 2cf go d ʰ] ʰ] e glæg f Yd ʰ
 æ h Y l [Yf gʰ] f ʰ d Y ʰ qgmilg ʰ k d [l' g]] dæ f Y] ʰ Yf ko] j k &
 + & E Yf q' h]] Pp] k n f Pp] k ʰ Yn] ʰ hgk d an] ʰ g] f] _ Y an] ʰ [gf f gl Yæg f k &
 Kge] læ] k qgmig f d ʰ Yn] ʰ lg] dæ f Y] ʰ o j g f _ [gf f gl Yæg f k &
 , & Lg \] [d ʰ] j Y o g] \ ʰ qgm \ g f ʰ c f go S d g g c ʰ g j É ʰ
 h]] Pp Skm Pp S j g g l o g] \ S [gf l] pl [n] k S j] d Mæg f k ʰ d ʰ lg Yf gl ʰ] j ʰ
 d f _ n Y] &

3. 

) & E Yc] ʰ Öj]] kÓ gʰ o g] \ k o d ʰ] j] d M] \ ʰ e] Yf a _ k 2kf g f qe k S Yf l g f qe k

5.

HjY[ld]`qgnj`f]o`ogj`k'af`=f`dk`'od`']Y[`'gl`']j&Bndj`Kf[`]r`o`gn`d`[ge`]
lg'e`']Y[`\Yq`Yf`\kYq`Yk]f]f[[]`nkf`_`Yf]o`O`J`=`o`gj`\O`']`Y`bml`d`Yf]`\&
L`']`k]f]f[[]`Y`f`gl`'af`_`lg`'g`o`d`'gnj`[`gf`n]`j`k`M`ag`f`S`Z`m`l`''`]`cf]o`'Ao`Y`k`Y`k`Y`]
h]j`kgf`'od`'o`'ge`'lg`h`j`Y[ld]`'k`O`]o`'df`_`n`Y`_`O`@]`'æ`h`j`gn`\`'k`i`f`_`dk`'`df`%
`n`Y``'k`ad`k`Yf`\`ng[`Y`Z`nd`j`q`k`a`f`ā[`Y`f`ld`q`Z]`lo`]]`f`l`']`KE`9`J`L`h`j`g`_`j`Ye`'Yf`\`k`Y]`af`_`
Aj`Y`n`m]]`h`j`g`g`k`@]`'A`g`f`'o`g`'ā`ū`o` A`f`i`k`'ng`f`L`f` — b



læf k'af Y[gdj'qgmīc]SYf\`ogj\k'o d`f]_Yla] '[gf fglYlæf k'af Y[gdj'qgm\gf Õ
 æc] &L`] ? J= qn] klg`nYdM] `Ò)_j]] kÖ] kh] [æ'q'af` Yf Yq`_q`i n] klæf k&O jd`
 ogj\kl` Y`Yj] `Q] kkl` Yf Ól`] hjge hl`ogj\`gf 1`] d`1 kà] `g^1`] [Y\`Yf\`ogj\k`
 l` Y`Yj] `Q] Y] j 1` Yf Ógf 1`] ja` l&g]] pYe hd 2

X			
æ h] lngnkqj	i nã cdj	Y[[]djYl]\	nj_]fl

..... _g'Z] qgf\`kf gf qe k'g Yf l'gf qe k&KY]l'o d` Y[ge e gf`
 ogj\`qgmīc go`Yf\`Y\`j] dM]\`ogj\`k&Ø 1`] kYmjk'g]] n] f ? gg_d [Yf Z] Y_] Yl`





ghhj]kk2knZlj [l'

dZ]jYl] 2'j]]

kge Z]j2[']]j'

`gf]kkq2j] hmlYZd'

]gf 2e ge]f1'

]d [lagf 2af Ym_njYlagf

; `ggkl ']] k] [gf\ hYaj 'g^o gj\kl' Y'e gkl [d Y]dq'e Yl[']kl'] j] dMagf k' ah' Z]lo]]f ']] 'Tjkl'hYaj&

`YajZjnk
kl]h2Y\ \]j
hna]q2gh]
ha]lnj] 2 ggc
\ggj2ZjYq

hgq2 Yhha]]kk
kYf]kk2d]
'nf_]j2Ye ak']\
_d\A] [klYaf
hjYak] 2Ym

Ykkkl2Yaf ^Yngj
[jda]a] 2]fajYl]
[jda]a] 2]gj]] [1
af 'gje Ylagf 2]gf 'mk]
ljYp['do k2km] 'la]c]lk

Zggc2ZjYq
lj]o]dj2]j['Yf1
kl]n]hg]2]lkl
bn_] 2Yo q]j
FgZ]dH]a] 2]o Y]\





;\ggk|l'|k|[gf\hYj'g^ogj\kl`Y'e gk|[dgk]d'ie Y|`\`k|l`|'bjkl'hYj'g^`
 k|e`o'gj\k&

)&|]l' 2[ge Z

;\ggk|l'|k|[gf\hYj'g^ogj\kl`Y'e gk|[dgk]d'ie Y|`\`k|l`|'bjkl'hYj'g^`

→

hnd|qjgh|

hd|lnj| 2 ggc

;\ggk|l'|k|[gf\hYj'g^ogj\kl`Y'e gk|[dgk]d'ie Y|`\`k|l`|'bjkl'hYj'g^`

*&gjgo 2|nYkY|`\`

lgq2 Yhf|kk'

kY\|k2_d|

→

_d\2|kYd|

[d]k2hY|g^kh|]l`

hjYk|2Ym

+&d|[lnj] 2|Yf`

Ykk2 Yf`^Yngj

[jdd`r] 2|f`ajY|

→

f`gje Yagf 2gf`nk|

ljYp[`d'o k2kn|l`c|lk'

,&nf an|jkdq2|\`ggd

\gnZd|l`Y|l|j`Yagf

Zggc2ZjYq

g|

h|o|dj2|j|`Yf|

Ydg`Y`

k|nhlgj2jldl

bn_|2'o`q|j

→



K|d|f|ldkYf`\|f`_f|]jkgl|f`nk|`YfYq_d|k|g|]phd`f`nf`Ye ad|l|]je`kgj`a|Yk`
 lg`gl`|]jk&E`Yf`q`g`qgnj`Ye`ad`e`|e`Z|]jkY|lnYd|o`Yf|lg`cf`go`o`Y`l`qgm`g`Yf`
 f|]`\`YfYq_d|k|g`nknYdr|`[ge`hd|p`kdnYagf`k&A`qgm|]Y|`Sogmio`ad|Pf`\`YfYq`%



=n] f`a`qgm\gf [j] e] e Z] j`] ` e] Yf a` _ g` Y o g j \] p Y [l d f S q m i e Y q`
 c f g o ` a`] ` ` o g j \] h j] k f l k g e]] ` a` _ g g \ ` g j Z Y`
 L]] l g f] ` g`] `] k f l] f [] ` o a d l _ a n] ` q g m [d h] k Y k l g`] ` j a ` l ` Q e g l a g f Q &

] d e a f Y l] Y f q`
 [` g a] k l ` Y l ` q g m [Y f 3 n k] h j] P p] k S m P p] k S j g g l ` o g j ` k ` g j [d h] k ` g j`
 g l `] j ` o g j k &

4. b . . . h .

K [a f l a k k e n k \] n] d h] p [] d f l j] Y a f _ ` k a k k & L]] Y a f _ [g e h j] `] f k a g f`
 h g j l a g f ` g`] ` ? J = l] k k q g m j ` Y Z a d l q ` l g ` n f \] j k Y f \ ` Z g l ` k g j] Y f \ ` d f _ j] Y a f _`
 h Y k k Y _ k & L] ` h Y k k Y _] ` o a d l Y h h] Y ` g f `] `] k j]] f & = n] j q P 1 ` ` d f] ` ` o a d l Z] ` f n e Z] j] \ S
 l g ` h j g n a] ` q g m i o d ` Y f ` g j a f l Y a g f ` l g `] `] h Y k k Y _] & k g e] ` h Y k k Y _ k Y j] ` d f _ j] ` Y f`
 [Y f ` P l ` g f `] `] k j]] f S Z n] ` q g m [Y f ` k j g d h h Y f \ ` g o f ` c] q o g j \ k g j ` h ` Y k] k g f ` q g m j ` k j Y l [` ` h Y h] j`
 Y k q g m j] Y `] ` h Y k k Y _] & l] m] k l a g f k o a d l Z] ` k g o f ` g f] ` Y l Y l a e] & l] m] k l a g f k l q h a %
 [Y d h ` Y n] P n] [` g a] k ` j g e ` o ` a ` ` q g m k] d [l] `] Z] k l Y f k o] j q g m [Y f ` e g n] Z Y [c`
 Y f \ ` g j] ` Z] l o]] f `] ` h Y k k Y _] Y f \ `] ` i n] k l a g f ` k [l a g f & L] ` i n] k l a g f k g f ` q g m j`
] p Y e ` e Y q Y k ` q g m l g ` a] f l a q l `] ` e Y a ` a] Y S a f l] h j] l `] ` Y n k ` g j Q l g f] ` g j g h a f a g f S
 h j g n a] ` Y [l n Y d a f ` g j e Y a g f S g j ` Y j Y o ` Y f ` a ` j j f [] ` j g e `] `] h Y k k Y _] ` g j ` k g o ` g l `] j`
] n a] f [] `] ` Y l ` q g m i n f \] j k l g g `] `] h Y k k Y _] &] _ a f a ` a ` G [l g Z] j S * (. `] ` ? J =`
 o a d l h d [] _ j] Y l j] ` e h ` Y k k g f j] Y a f _ [g e h j] `] f k a g f Y f \] ` d e a f Y l] `] ` Y f Y d g ` q`
 i n] k l a g f k & L] k l Y c] j k o a d l Z] ` Y k c] \ l g ` a] f l a q] k f l] f [] k a f `] `] h Y k k Y _]`
 l ` Y l j] d l] `] ` k Y e] ` a] Y Y k Y h j e h l ` k Y l] e] f l & ` `] [c `] ` ? J = o] Z k a] ` g j`
 n h] g e a ` a ` g j e Y a g f &

9 d e g k l n j j q h Y k k Y _ ` Y k Y e Y a] Y & C] h l `] ` e Y a ` a] Y g`] `] h Y k k Y _] ` a`
e a ` \ o ` a] j] Y a f _ g j Y f k o] j a _ i n] k l a g f k &

D g f _ h Y k k Y _ k Y j] ` g j _ Y a] ` a ` h Y j Y _ Y h ` k & B] \ ` g o f ` h ` Y k] k Y f \ ` Y e Y a ` a] Y`
 ` g j] Y l ` ` h Y j Y _ Y h ` ` g f ` q g m j ` k j Y l [` ` h Y h] j ` o a ` Y f] Y j Z q d f] ` f n e Z] j \] f g l \ S



'gj] pYe hd SÖ- 'Ynf Yde a jYlägf Ó'gj: ä 'gje Ylägf 'l' Y' kYjlk'gf 'df] * / 'YZgm'
 'Ynf YdZf æ Yd'e a jYlägf & ^qgmif]] \ lgj] 'lj ZY[c'lg'l'] 'hYkY_] 'gj \] Yä'lg'
 Yf ko] j Yi n] klägf Sqgmo adcf go `` go 'lg Pf \ 'l'] 'ä 'gje Ylägf 'o ä` gmlj]] j] Yäf _
 'l']] flq] 'hYkY_] &

E gk'g^l'] läe] h] gh d j] Y' hYkY_] d] sl' Y' äk'l'] q \ gf ÖhYq] f gm ` Yll] flägf
 lg _ Ykh'o ` Yl'l'] q Yj] j] Yäf _ & Qme nk' [ge hj] `] f \ ðf gl' d Yf %o ` Y' qgmY]
 j] Yäf _ & L' äc' YZgm' o ` Y' qgmY]] j] Yäf _ &
 H] Yh` jYk' [gf 'nkäf _ gj [ge hd] Yl \ hYjlk & Ökc' qgnjk' d'i n] klägf k' Yk' qgmY]
 j] Yäf _ & gq AglA



... ..

) & è Yc]k'YZkgdhl] 'klY] e] flk'l` Yl'nk] 'ogj\k'dc] 'Öcb YqkSf] n]jS`
mf\]j']n]jq'[aj`ne klYf [] Ömf d'kk'l`] i n] klagf 'ak'Yf` ..



5S-S4S6S² S³ S.

? g'gn]j 1' af_kdc] 1']Y] Yg^Y[aj[d Sl'] i nY%
 \jYl']i nMlagf Sl']]i nMlagf lg\]]je f] 1'] d'f_1' g^1'] ``qhg] f mk] &
>dk [Y\kYj]] kh] [aYdt] d'nd'gj] n] o f _'gje nMk&

dc] 'e ndhdaf _Ski nY]] jggkS] phgf] flkS
 \] [aE YkS^Y] lagf kS^Y] lgf _S] gf k] [n]an] f l]] jkShgk]an] P f] _Man]
 f ne Z] jkShjæ] kS] l] &

] jaf _d kS] [ge hYf _k] kYf \ Yf _d k3\ ak] [lf _
 [ge hd pP_n] k'f lg kæ hd 'gje ko `] j] qgm] Yf \]] je f] nYd] k&
 'z&, 'k [dgk] f gm ` ! ki nY]] jggk`
 žh'lg') , ,] S] [ge e gf] jaf _d 'k] k

< gf ØZ] hYf d c] \ Zq , , S] n] f 'kjYf _] 'gf] ko d ` e \] %h`
 \] P f aagf k&

D] Yf 'lg' , , o d` gmi d f _1' q [Yd nMlagf k&

Qgm] Yf] dæ f Y] 'e Yf q Yf ko] jkæ e] \ a] d] q]

Mk] ' [ge e gf 'k] f k] 3 [`] [c 1'] 'nf ak&

; ge hYjagf i n] klagf kYdnk] 1'] kYe] 'gje &

Qme nk] [ge hY] 1'] nYd] k'f ; gche f 9 Yf \ ; gche f : &

; gche f 9 'ak] d `] j] i nYd] gZ!Sd kk] Yf ž!Sg] _] Y] j 1' Yf ž!S] gche f

: Sg] 1'] [ge hY] Y]an] nYd] 'g^9 Yf \ : Q Yf f gl' Z] \]] je f] \ Ó] gje 1']
 f 'gje Ylagf _an] f 'f 1'] 'hjgZde &

L]

žki nY]] jggkSe Yq'Z] 'hgk]an] 'g] f] _Y]an] f ne Z] j] !&

1' ak'kge] læ] kYd] Y'akf] \] \ lg \]] je f] 1']
 [gj] [l Yf ko] j &] j] Yc \ go f 'qgnj] ge hniYlagf 'af lg'o gjcYzD' k] hk&

] kh] [aYdt] o gj \ 'hjgZde k [Yj] 'nd] Z] 'gj]
] e ZYjca' _gf 1'] 'e Y' &

< gf ØYkne] 1'] P_n] kY] \ jYo f 'lg' k] Yd 'nf d k'k] [aP Ydt k] Y] \ &
 9 h] l] nj] e Yq'Z] 'o gj] 'Y] 'gnkYf \ 'o gj \ k&

& Qgm] Yf , , a'f] [] kY] qLj q`
 kY] laf _o d ` 1'] 'e a \ d] nYd] & , , 'lg' nY] aZD] k'lae] Yd] go k&



L' akhYjlg^T] pYe l] klcqgnj YZadq] g'af l] hj] l'af 'gje Mafg \akhdq] \af
 _jYh`k&l m] klagf k[ge Zaf] af l] hj] l] Mafg 'g^l] pl'Yf \P_nj] k&E gj] T' Yf 'gf] _jYh`
 gj] YZd 'e Yq'Z] j] i nq] \lg'Yf ko] j' Yi m] klagf &Kge] lae] T'] P_nj] k[Yf f gl' YdZ]
 k] j' gf T'] k] j] f 'Yl T'] kYe] lae] Yf \cgm` Yh] lg' k] jgdnh Yf \ \go f 'lg' k]]
 T'] e &Qme Yqf]] \lg' [gf n] j] 'Y] l' agf klg' 'jge 'h] j] [f lY_] kZ] na] o T' akkad&

) ! 'Hj] ['Y] lk%nk \lg] j] hj] k] f l T'] hY] lk' g^Yo` gd 'gj L
 * ! 'Df] _jYh` k%nk \lg] j] hj] k] f l e Yl] e Yl' Yd] d] l' agf k` ahk
 + ! : Yj _jYh` k%nk \lg' [ge hY]] \YY

I n] klagf kknk Yd] 'af ngd] T'] j' Mafg 'g^a^j] f l _jgnhk
 E Yq'af ngd] 'h] j] [f lY_] k'gj 'Y] l' agf k
 E Yqf]] \lg' _jYo 'jge 'af 'gje Mafg 'af 'Yj] Yaf _hjgZd e

;] [c T'] : 'gf 'Zgl` Yp] k
 E] Yknj] e] f l ke Yq'Z] ;
 K] Yd] k 'Zm] f gl' _m] Yf l]] \
 ? jYh` k 'gf d] hY] l' g^Yj Yf] _] e Yq'Z] k' go f

;] [c : 'gf 'Zgl` Yp] k
 E] Yknj] e] f l ke Yq'Z] ;
 K] Yd] k 'Zm] f gl' _m] Yf l]] \
 ? jYh` ke Yq' : 'gf d] hY] l' g^Yj Yf] _] e Yq'Z] k' go f
 'e Yq'Z] nk \

Qme Yq' K] jgdnh gj \go f 'lg' _] l] g' T'] Qa` lO_jYh` 'gj T'] i m] klagf &
 f gl' T'] o Yq' T'] _jYh` Qgck lOg' cgm' Zn]
 'f g] pY [l f ne Z] j' akhjgn \ Yf \
 A T'] k] [Yk] ksl'] ja` l' Yf ko] jk Yj] 'Yj] f gm` YhYl T' Yl] j] gj 'af
 Yhjgpae Yl' T'] nYdh] k' gnaf Qd Y \cgmilg T'] o jgf _Yf ko] j] Qgmil gnaf] n] f
] de af Yl] lo g' Yf ko] jk l' Yl Yj] k' g [dg] l' g_] l'] j T' Yl Yhjgpae Yl' g' o gnaf Qo gjc &



lg'Yf ko]j'e Yf qi m] klæg k&H]Y[la]
e Yf áhndMaf _Yhhjgpæ Yl]nYdh]kSdc] '++L 'Yk)'+'gj)'-L 'Yk)'. &



) &9db Yqk'Yngà 'nf f]\]\Sdf _l' q'[ge hniYlagf k&
Mk] 'Yhhjgpæ Ylagf kYf \ 'qg_á &

* &O `]f 'ogjca' _'o d' 'nYjáZd kSj]e]e Z]j l' Yl'
l']q:[Yf]j]hj]k]f l'Yf q'f ne Z]jSnf d'kk'gl']j%
o ák] 'kYl]\Sl' ák'á [dñ]k'jY[læg f kS\] [æ YdkS
r]jgSf]_Yla] S'Yf \ 'hgkda] 'f ne Z]jk&- gf Õ_]l'
hYf á c]\ 'á'l'] 'nYjáZd 'Yj] 'f gl'YSZSpSgj 'q&

' +& ðpYe á] Ydll'] _jYh' kYf \ P_nj] k'Z] 'gj] 'ogjca' _l'] 'hjgZde &L']
Yf ko]j'e Yq'Z] 'e Y\] 'e gj] 'gZnægnk'á l'] P_nj] kl' Yf 'á l'] l]pl&


' , & ðpYe á] l'] '[ge hYjYla] 'f Ylnj] 'g'á l'] 'lo g' [gdne f k'á '[ge hYjæg f'
i m] klæg f k'Z] 'gj] \ 'gá _l'] 'e Yl' &G 1] f Sl'] 'Yf ko]j' ák'gZnægnk'ó á' gm'Y
[ge hcl Yl] \ '[ge hniYlagf &

' - & F]n]j _m] k'Q' Yf f gl'Z] \]l]je á] \ Óá Y'[ge hYjæg f 'i m] klæg f 'nf d' k'
l'] 'i m] klæg f '[gf lYá k'nYjáZd k'gj _]ge]ljá P_nj] k'gj ki mY]]jggk&

' . & E Yc] 'knj] 'qgnj' Yf ko]j' ák'á l'] j]i m] kl' \ 'nf ák& d'kká 'o jgf _Yf ko]j]



) (& < gf Øhj] knø] t' Y'Z] [Ynk] 'qgmY] 'Ye Y' 'e f gj 'qgm\gf Øf]] \ lg'
hjY[ld] 'gj] n] f] j] n] o 'e Y] j] d'gj t'] i nYf ldYan] 'hg] l' g^t'] ? J=&



Qgmoadl Yn Y[gá] g^Qj_ne] flÓlghá kSZni'o adf k| Y\ Z] _an] f Yf`
Yj_ne] fl lg`Yf Ydr] &L] Qj_ne] fl ÓlYc`hj] k| fl kY`a^] j] fl [` Ydf_] `jge T` Y`
g^T] Ökn] ÓlYc&Aj] i nj] k'qgm] g [jda n] Y_an] f Yj_ne] fl Zq`d k| nkaf_``go`
o] dj] Ygf] `qgm] f`T` Yj_ne] fl &Qgmoadl]] `lg[gf k\] j] l



=Y[` lgha' f l' akk] [lagf' e Yc] kY[dæ' YZgm' Yf' akm] l' Yl] kl' Yc] jk[Yf' \d%
[nk' jge' nYagnk'h] jkh] [la] kYf' \Yhdq' lg' e Yf' q' \a' j] fl' km' Magf' k' gj' [gf' \dagf' k&
Qgn' lg' Z' ak' lg' hj] k' fl' Y[ge' h] daf' _ [Yk' 'gj' qgn] gof' hgk' dagf' 'gf' l'] 'akm] &

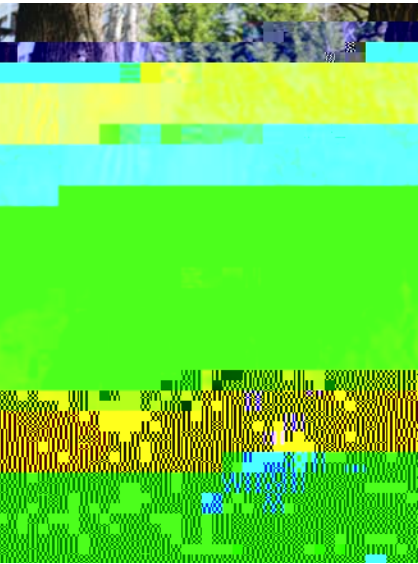
J] Y' l'] lgha' [Y] 'nuth' L' f' c' YZgm' l'] [dæ' 'jge' k] n] jYdhga' l' kg' ^na] o 3
e Yc] f' gl] k' YZgm' l'] 'hgk' dagf' 'qgmio' Yf' l' 'lg' Yc] 3l' f' c' g' ^] pYe' hq' kl' ' Y' qgmio' Yf' l'
lg' \n] qh' e' gj] 'nuth' f' 'qgn] 'kk' Y' q' L']] pYe' hq' k' [Yf' Z] 'jge' 'kge'] l' f' _ 'qgm' Yn] '
j] Y' Sd' Yf] \f' [dkk' gj' cf' go' 'jge' _] f] jYdcf' go' d' _] &

A' ak' æ' hgj' Yf' l' l' ' Y' qgm' Y' \j] kkl'] [] f' lj' Yd' km] 3' go'] n] j' Sqgm' Y] 'j]] lg' Yc] '
Yf' q' Y' hj' gY[' qgmio' ak' & > gj] pYe' hq' Sqgmie' a' l2

- [ge' hd] l] d' Y' j]] 'gj' \ak' Y' j]] 'o' a' l'] [dæ' '
•



+&] [à] `Yl' hgklæg f' t'] 'dkn] 'qgmio Yf l'lg' lYc] Yf \ \] [à] `Yl' [ge h] ð
df _] nà] f [] 'j] Ykgf kYf \] pYe hd k' qgm [Yf ' nk] 'lg' knhhgj] 'qgnj' hgklæg f' &



; Yf 'qgmY [lnYd] `Yn] 'nf' 'hj] hYj f' _ 'gj' t']
? J=7Q kSg ^ [gnjk] & ^ Yd \] h] f \ k'gf ` go 'qgm
YhhjgY [` \] n] ðhf _ t'] 'kca k' Yf \ ` e f \ k' l'
lg' hj] hYj] 'gj' \ g f _ 'qgnj' Z] k' g f t'] ? J=Sg'
Yf ql' f _] d k' f ' d \ & L'] 'H]] k' f l' Qgnj' H] jkh] [lan]
gf ' Yf 'dkn] ÓlYk' ak' Yh] j' [l]] pYe hd 'g ^ go 'qgm
[Yf] f' l' gq' hj] hYj f' _ 'gj' t'] ? J=&

Hj f' t'] 'dk' g ^ h' jge hlk' jge t'] ? J= 'o] Zk] &
LYc] t'] e 'o d' 'qgmio `] f' 'qgm_] l' lg_] t'] j' 'o d' '
j' d' f \ k' o ` g' Yj] 'hj] hYj f' _ 'gj' t']] k' & k' nk' k'
dkn] k' o ` a j' 'qgmhj] hYj] 'gj' ` Yn] \ f'] j] S_g' k' gh%
hf _ So Yd 'gj' t'] 'e' gn] 'lg' k' Yj] S\ ja] 'lg' t'] [d' z'
o `] j] 'qgm \ Yf [] S' g_ 'gj' o ` Yl] n] j' 'qgm \ g' 'gj' 'nf' &
Q k' S' qm [Yf ' Yc' YZgn] ZYk]] ZYd k'] g]] k' g' k' c' a] '
d' f_] k' 'gj' Yd l' d' o ` a j' S' Zn] 'o' ad l' g' k' l' gh' k'

Y'] [l' 'qgnj' 'nlnj] 7Kh] f \ f _ l' a e] k' Yj f' _ à] Yk' Yf \ _] ll' f _ e' gj] [ge 'gj] lYz d' 'o d' '
] ph]] k' k' f _ 'qgnj' gh' f' a' f' k' e' Yq' Y'] [l' o `] j] 'qgm_ g' l' g_ j' Yn' Yl] 'k' ` gg' d' Yf \ 'qgnj'
] f' l' a] [Yj]] j' & ^ n] k' 'qgnj' l' a e] 'Yk' o' a k' d' Yk' qgmio ad' f' n] k' 'qgnj' e' g' f] q' a' t'] 'nlnj] &



) & LYc] f' g' e' gj] t'] Yf) ('e' f' n]] k' l' g' l' g' l' \ go f' Y'] o' f' g]] k' l' g' nà] 'qgnj' 'o' j' a' f' _ &

* & k' Yj] 'o' j' a' f' _ 'qgnj'] k' Y' q' o' d' ' Y [d' Yj' k' Yl] e] f' l' g ^ 'qgnj' hgklæg f' &

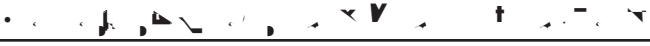
+&] n] ðh' t']] pYe hd k' l' g' knhhgj] 'qgnj' hgklæg f' & M k'] k' n] j' Yd] pYe hd k' g' j' Yf '
] pl' f \ \] pYe hd 'lg' knhhgj] 'qgnj' hgklæg f' &] Yj] Yf _] 'hg' f' l' k' l' g' a e' h] jgn] t'] '
ð_ a' Yd' Bgo & > gj] pYe hd S \ g' f' ð' h' d' [] 'qgnj' Yd] j' f' Yl'] 'qhg' l'] k' k' g' j] pYe hd '
f' t'] 'e' à \ d' 'g' ^ t'] 'hg' f' l' k' knhhgj] f' _ 'qgnj' hgklæg f' &

, & ðk] 'o' d' 'Yk' n' e' Yj' q' k' Yl] e] f' l' t'] Yj] f' 'gj] [] k' 'qgnj' hgklæg f' &



- &Mk] Ć J=lqh] 'ng[YZndjQSo`] f 'qgm[Yf 'nk] 'kgh` dda Yl\ 'o gj\k'hjgh]j d&
< gf Ćbmk l` jgo 'af 'o gj\kZ] [Ynk] l`] q'kgmf _gg\&F] n]j 'nk] 'Yo gj\ 'af 'Yf`
]kkYq'af'qgmYj] 'f gl'knj] 'g^ake] Yf af_&

. &] 'knj] 'lg Ydgo 'Y'd Yk- 'e af ml] kl'g hjgg^j] Y\ 'qgnj] 'kkYq'snZkdlml] 'Ye gj]`
kgh` dda Yl\] l]je 'gj Y[ge e gf 'o gj\SY\ YljYf kda'f Ydk] fl] f[] 'gj 'h` jYk] &



L` akk] [lagf 'g^l`] l] k' Ykk] kk'qgnj 'YZad]q'lg 'Yf Ydtr] 'Yf \ [jda m] '[d'ae k`
Yf \ 'lg [d'Yd] 'phj] kk'qgnj l` gm` lk'YZgnl`] e 'af 'o jda' _&L`] 'hje hl'o adl`
af [d'hl] \ 'YY'Yf \ [gf [d'kagf k&QgmYj] 'lg'hj] k] fl' Y[ge h] d'af _ [Yk] 'gj 'qgnj 'go f`
Yf Yd'k'g^l`] [d'ae SZYk] \ 'gf l`] \ 'MY_a] f 'Yf \ 'qgnj 'Ykk] kke] fl' g^ak'k] f_l` k`
Yf \ 'o] Ycf] kk] k&



L` ak'k'Yf] p] j] [d] 'af [jda' Ydl` 'af cf_ 'o` ` 1 f Yk'Yf] d' A Yf'gd'Yf \ A

v h . g x r . x x h , x k l y . e . e



Chapter Three: Enhancing Logical Thinking Skills

Gnj'gja'f YdKE 9JL? J=H] h'O gjck' ghk'af [dñ\ \ k] kæg'f k'gf 'kgdñf _ \] \nñ%
 lan] j] Ykgf'af _'h'jgZd'e k'äc] t' gk] 'hj] k] f] l] \ 'af t'] 'Yf Ydñ] Ydñg] l'æg'f 'g^l'] '? J=&
 L' ak] k] [l'æg'f 'g^l']] pYe 'o Yk] äe' af Yl] \ 'af' * ((*SZn] k'n]] f l'k'g' d' t'] 'kcañk'] q'
 \] n] dñ] \ 'kgdñf _ t'] 'h'jgZd'e k'o] j] 'n] j'q' n] Ydñ] Zd' & O] ' ' Yn] 'af [dñ\ \ Yk] l' g^
 d'g'af 'h'jgZd'e k'l' Y'e Yf q'h] gh'd 'o ad] Pf \ 'af] j] k'af _ 'Yf \ \ ' Yn] 'mf' 'kgdñf _ 'o' \ 'af'
 l'] q] f' 'Yf [] t'] ä' \] \nñ] lan] j] Ykgf'af _ 'kcañk' & Kge] 'g^l'] 'h'jgZd'e k'e Yq'k]] e'
 ' Yj \ Yl' P] k] SZn] 'gnj' k'n]] f l'k'g'nf \ t' Yl' o' d' 'Ydñ] d' h] j] k] n] j] Yf [] 'Yf \ 'kge] l'ae] k'
 [] ['ca' _ t'] 'k] Yl] _ ä' k' _ an] f' Yl' t']] f \ 'g^h'jgZd'e kSl'] q' \] \nñ] \ 'Yf ko] j'k' Yk] j'
 Yf \ 'Yk] j] & @ Yn] 'mf' :



Kap'k'n]] f l'k's9f b] d] YSE ä' \ Y] dSD] l'ä' ä' SO' \ d] [dñ] S] Yqe gf \ 'Yf \ 'æg'f Yl' 'Yf SY]]
 l'] l'gh'k'ap] j] Yf 'ca' _ k'n]] f l'k'f' gl' f] [] k'k] Y'ad] 'af' 'gj' \] j] 'af t'] ä' _ j] Y'n] Y'af _ [dñk'&=Y] '
 g^l'] 'k'ap'k'n]] f l'k' 'Yk'Y' \ 'af'] j] f l' e' Y'gj' 'D: äg' d' _ qS; '] e' ä] j] qSE Yl'] e' Yl'ä' kSH' qk%
 ä' kSH' q['g' d' _ q' g] '9j [\ d] [l'n]] & Yk] \ 'gf t'] 'g' d' g' o' af _ [dñ] kSh'd Yk] 'Yf ko] j' t']] -
 i m] k'æg'f k'Z] d' g' o' &

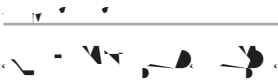


```
*& O`a`g^l` ]`gdgo f`_akYf`Yl`[]hlYZd`gj`j`g^jYf`c`Zjge` )kl'g`.l`!7
. . . Y&D]lā ā'SO`d][`q̄m`S]Bf`Yl`Yf`SJ`Yqe`gf`SE`ā`Y][`dS9f`h]d]Y
. . . Z&O`d][`q̄m`SE`ā`Y][`dD]lā ā'SJ`Yqe`gf`S]Bf`Yl`Yf`S9f`h]d]Y
. . . [`&J`Yqe`gf`SD]lā ā'S9f`h]d]Y]Bf`Yl`Yf`SO`d][`q̄m`SE`ā`Y]d
. . . \&9f`h]d]Y]Bf`Yl`Yf`SO`d][`q̄m`SD]lā ā'SJ`Yqe`gf`SE`ā`Y]d
. . . ]&D]lā ā'SJ`Yqe`gf`S]Bf`Yl`Yf`S9f`h]d]Y]SE`ā`Y][`dO`d][`q̄m`
```

```
+& A'9f`h]d]Y]Yf`ck,`l`Yf`\`D]lā ā`\g]kF`GL`jYf`c`k]Sl`]f`
. . . B]f`Yl`Yf`e`nk]jYf`c2
. . . . Y&)kl
. . . . Z&*f`
. . . . [`&t]j`
. . . . \&-l`
. . . . ]&l`
```

```
, & A'9f`h]d]Y]Yf`ck,`l`Yf`\`e`Y]g]k`f`Hq]l`g`g`_qSYf`\`B]f`Yl`Yf`Q`e`Y]g]`k`
. . . ;`e`d]j]q]l`]f`D]lā ā`e`nk]jYf`c2
. . . . Y&)kl
. . . . Z&*f`
. . . . [`&t]j`
. . . . \&-l`
. . . . ]&l`
```

```
- & A'O`d][`q̄m`jYf`ck,`l`SYf`\`E`ā`Y]d\g]kF`GL`jYf`c`d]k]Sl`Yf`E`ā`Y]d
. . . [ḡmā`e`Y]g]`f`Yf`q`g^l` ]`gdgo f`_`=P;`=HL2
. . . . Y&`g`g`_q
. . . . Z&``]e`d]j]q
. . . . [`&E`Yl`]e`Ylā`k
. . . . \&H`qkā`k
. . . . ]&9j[`d][`l]m]
```



```
) & =
. . . * & ;
. . . + & <
. . . , & 9
. . . - & :
```



, &L`] km\]fl'e Ygjaf_`af` : ag]f_`af`]]jaf_`ak'omaf_`af`o`d` jgge 7

· Y&*() 9..... Z&*(): [&*(*9'' \&*(*:



>a] km\]flk'af` Ykne e]j`Zage]\d Ydk[d f[[]kj]k]Yj[\`h'jg_jYe ``Yh] Z][ge]`



- * & L] Pn] km] flkYj] 2l'] hj] %] \d Yde YtgjSl'] km] fl' jge ; ` d Y_gS
l'] km] fl1' Yl' ZgYj\ \ Yl' OZ (Sl'] e gd [m] j Zgq_ q' e Ytgj Yf \ l']
km] fl1' Yl' ZgYj\ \ Yl' OZ - &
- + & L] km] fl' jge H] f f kqchYf aY' ZgYj\ \ bkl Z] 'gj] l'] hj] %] \d Yd
km] fl&
- , & K Yf \ YE gjjakSo` g` akf gl'] hkq[` gq_ q' e YtgjSZgYj\ \ Yl' OZ (&
- & E] j] \ d` O gf_ ZgYj\ \ bkl Z] 'gj] l'] hkq[` gq_ q' e Ytgj zo` g` \ af O
ZgYj\ Yl' OZ (! &
- . & L] km] fl' jge O] klL pYk' kf] d'] j K Yf \ YE gjjakf gj E YjagNYd] rS
f gj' kl` akkm] fl1'] hj] %] \d f] e Ytgj&

⋮ ⋮ ⋮

-) &O ` d` km] fl' ak' jge H] f f kqchYf aY7
Y&E YjagNYd] r` Z&Z qj aY'; Ye hZ] dl [&K Yf \ YE gjjak
\ & < Yd '9lcnk'] &E] j] \ d` O gf_
- * &L] km] fl1' Yl' ZgYj\ \ Yl' OZ - 'ake Ytgj f_ f' o` d` P] d7
Y&H agkgh` q` Z&Hkq[` gq_ q` [&H] %] \d f]
\ &= f_ f] j f_] &E gd [m] j : agq_ q`
- + &E YjagNYd] r' ak' jge o` d` hY] l' g^ l'] [gnf lj q7
Y&F] nY \ Y` Z&< YdHk [& < ` d Y_g`
\ &O] klL pYk] &H] f f kqchYf aY
- , &9l' o` Yl' ae] \ a` ? qj aY'; Ye hZ] dZgYj \ l'] [Y7
Y&OZ (` Z&OZ - [&OZ (` \ &OZ -] &OZ (
- &L] km] fl' jge F] nY \ Y' ak' e Ytgj f_ f' o` d` P] d7
Y&H] %] \d f] Z&Hkq[` gq_ q` [&= f_ f] j f_]
\ &E gd [m] j : agq_ q`] &H agkgh` q`

⋮ ⋮ ⋮

> n] _ j k \ j] k k \ n h Yf \ l j d c' g j %] Y] \ ' g j @ Y d g o]] f z k k a Y S K g h a Y S A \ g j Y S
? d f \ Y d r Yf \ F k Y l e Y [` g ^ l'] e o g j Y \ a ^ j] f l [g k n e] z a j P _ l j j S N l] j f Y %
a f S 9 k j g f Y n I S G d e h a ` d] k c Y l] g j : Y d j a f Y l S a k Y \ a ^ j] f l Y _] z - S, S - S. ' g j / !
Yf \ o] f l g n i l j a c' g j %] M a ` Y Y \ a ^ j] f l l a e] g f @ Y d g o]] f z / z (h e S / 2 - h e S
O Z (h e S O Z - h e S O Z (h e ! & Y k \ g f l'] ' g d g o f _ [d h] k S h d Y k Y f k o] j l']
. i n j k l a g f k Z] d g o &



-
-) & L] _ədo`g`j]kk\`YkYf`G dje hā`ā]`kcYl]jSo`g`akf gl`Kgh`ā`Sak`gd]j`l`Yf`F`ak`Y`Yf`\`o]fl`gml`Z]`g]`l`] _ədo`g`ak`-`q]Yjk`gd`So`g` \`ā`f`gl`\]j]kk`YkY>ā]P_`l]j&
 - * & **A**Y`g]YSo`g`\`ā`f`gl`\]j]kk`YkY9kljgf`Yml`Sak`qgnf`_]j`l`Yf`l`] _ədo`g` \]j]kk\`YkY: Yd]jā`Y`Zml`gd]j`l`Yl`] _ədo`g`o]fl`gml`Yl`/2`-`he`S`o`g`\`ā`f`gl`\]j]kk`mh`YkYN]l]jā`Yjāf`&
 - + & B`kkā`YSo`g`akf`gl`:`q]Yjk`gd`So]fl`gml`+(`e`ā`ml]k`Yl]j`l`] _ədl`Y`ak` ,`q]Yjk`gd`Zml`)-`e`ā`ml]k`Z]`g]`l`] _ədo`g`\]j]kk\`YkY>ā]P_`l]j&
 - , & ?`d`f`\`Y`ā`\]j]kk\`YkYN]l]jā`Yjāf`Yf`\`o]fl`gml`+(`e`ā`ml]k`Z]`g]`l``Kgh`ā`Y`Zml`Yl]j`l`] _ədo`g`\]j]kk\`YkYf`9kljgf`Yml&
-



g` f `@YæYo YSC] ak` YO Yk` d`_lgf S9f bj d[YLgjj] kSJ gdf` KljY[c`Yf \`H]l]j`

. & L] h]jkqf`o d` *(`q] Y]k g^k]jn d] `f 1`] `9 a` >g]] So` g`a k`f g l`C] a k` Y
O Yk` f` _l g f S` \g] k f g l` B q 1`] ; % / Y f` \` Y k e g]] k] j n d] 1` Y f 1`]`
K] j _] Y f l S o` g` \g] k f g l` B q 1`] > % . &
/ & L] h]jkqf`o` g` B a] k l`] ; % *` Y k d] k k] p h] j a f []] 1` Y f` B g` f` @ Y a Y o Y &

) & O` Y l] j Y f c` a k` 9 f b] d] Y L g j]] k 7
Y & ?] f] j Y d` Z & D a] m]] f Y f 1`] [& g d f] d` \ & K] j _] Y f 1`]] & E Y t g j
* & O` Y l` \g]] k C] a k` Y O Y k` f` _l g f` B q 7
Y & %` Z & %` [& % *` \ & % .`] & %
+ & O` g` Y k` + (`q] Y] k g^k] j n d] `f 1`] `Y a` >g]]] 7
Y & ?] f] j Y d` Z & D a] m]] f Y f 1`] [& g d f] d` \ & K] j _] Y f 1`]] & E Y t g j
, & O` Y `Y a]] j Y l` \g]] k l`] h] j k q f` o d` * - `q] Y] k g^k] j n d] `B q 7
Y & %` Z & %` [& % *` \ & % .`] & % /
- & @ g o` e Y f q` q] Y] k g^k] j n d] ` \g]] k l`] K] j _] Y f 1`] Y n] 7
Y & (` Z &) -` [& * (` \ & * -`] & + (` . & O` g` B a] k l`] ; % / 7
Y & B g` f` @ Y a Y o Y` Z & C] a k` Y O Y k` f` _l g f`] [& 9 f b] d] Y L g j]] k`]`
\ & J g d f] K] j Y [c`]]] & H]] j < g] j]]`

/ & O` g` B a] k l`] ; % 7
Y & ?] f] j Y d` Z & D a] m]] f Y f 1`] [& g d f] d` \ & K] j _] Y f 1`]] & E Y t g j`
O & @ g o` e Y f q` q] Y] k g^k] j n d] ` \g]] k l`] h] j k q f` o` g` B a] k l`] ; % *` Y n] 7
Y & (` Z &) -` [& * (` \ & * -`] & + (`

V

9 f \ j] o S l n d] S J Y f \ Y d] @] a a Y f \ H g n f _ Y j] Y d l o Y a] j k Y l` \ a] j] f l] j] k Y m j Y f l k
Z G d n] ? Y] \] f S ; Y j Y Z Y C S G n l Z Y [c K l] Y c` g n k] S ; a d] B g j` @ n f Y f B a l`] q Y j]] Y l`]
o g j c a f` _ g f` Y \ a] j] f l` \ Y q f] p l o]] c Z E g f \ Y q D > j a Y q] Y f \ Y j] o g j c a f` _ Y \ a] j] f l`
k` a l` z` (Y e % h e S) (Y e % h e S) Y e % h e S) * h e % h e g j] * h e % h e] & Y k] \ g f 1`]`
^ g d] g o f` _ [d n] k S h d Y k] Y f k o] j 1`] : i m] k a g f k g f 1`] ^ g d] g o f` _ h Y] &

) & L] h]jkqf`o` g` o g j c k` g f L m] k] Y q S o` g` a k` f g l` J Y f \ Y d] Y k Y k` a l` 1` Y l`
k] Y j k d l] j 1` Y f 1`] `e Y f` o` g` o g j c k` Y l` G n l Z Y [c K l] Y c` g n k] S Y f \` Y k Y
k` a l` 1` Y l` a k` k` g j] j 1` Y f L n d] &



*& 9f\j]oSo`g\g]kfgl'ogjc'gf Ln]k\YqSo gjckY\Yq]Yd]j'l'Yf'l']`
h]jkfg'o`gk'k'al'kY]kY))Ye So`g\g]kfgl'ogjc'Yl';`adSzm`
gf]\YqY]j'l']oge Yf'o`g'ogjckYl'; YjZYqSo`gk'k'al'kfgl`
.``gnjkqf_&
+& @]aSo`g\g]kfgl'ogjc'Yl';`adS`YkYk'al'l'Y]kY]k]Yd]j'Yf'\`
dMkqf_]j'l'Yf'l']h]jkfg'l'Y'ogjckYl'l']Gdn]?Y]\fSo`g\g]k'
fgl'ogjc'gf Ln]k\Yq&

< ' ' - |

)&O`]j]\`g]kl'l']h]jkfg'o`gk'k'al'k)*he%he'ogjc7



1
2
3



- * & · E a`Y]dD]kcYmSo`g`akf gl`Y[ge hml]j hjg_jYe e]jSakl`]kgnl`]jf`
f]a`Zg]g^l`]j]k\]fl`g^l`]lYnh]`gnk] &
- + & · L]]fgl`]jf`e gk`gnk]`gf`l`]Zq[c`akh]jao`f`cd`SfY`ak`*`ggjk`Yo`Yq`
]jge`l`]`ge]`g^l`]n`jg`g`_d] &
- , & · DgijYaf] HM]dSo`gk`gnk]`akf`gl`k]Y_]]f`Sdn]kja`l`f`l`]e`a`d`g`
l`]Zq]c &
- - & · L]]k\]fl`o`d`l`]lYnh]`gnk]`So`g`ak`Yf`]f`_f`]j]Sakf]a`Zg]ko`d`
DgijYaf] HM]d &
- . & · L]]ge hml]j hjg_jYe e]j`g]k]f`gl`dn]`f`l`]`Y]`gYd`gnk]`f]`pl`ggj`
lg`Bryf`dYE]f`r &
- / & · L]]k]Y_]]f`gnk]`ak]kgnl``g^l`]e`nklY`gnk]`f]`pl`g`o`]j`l`]`
]`]e`d`dn]k &

) &O`Y`Y\]kk`g]k9m]j]q:]Yddn]7

- Y!`- ((Krf`k]l]LjYad Z!`- () Krf`k]l]LjYad [!`- (* Krf`k]l]LjYad
- \!`- (+ Krf`k]l]LjYad]!`- (, Krf`k]l]LjYad

* &O`Y`akl`]hjg`k]kagf`g^l`]j]k\]fl`g^l`]`Y]`gYd`gnk]7

- Y!`[ge hml]j hjg_jYe e]j` Z!`]f`_f`]j` [!`n`jg`g`_d]
- \!`nf`a]j]k]q`e`Y`hjg`k]kagf`]!`[]`e`d]

+ &O`g`akl`]`[ge hml]j hjg_jYe e]j7

- Y!`9m]j]q:]Yd Z!`Bryf`dYE]f`r` [!`Bkl`f` ; `]f`
- \!`E`a`Y]dD]kcYmi]!`DgijYaf] HM]d

, &O`Y`[g`g]`akl`]n`jg`g`_d]`gnk]7

- Y!`lYnh]` Z!`e`nklY`\` [!`h]jao`f`cd`
- \!`[]`Y]`gYd]!`k]Y_]]f`

- &O`g`akl`]j]k\]fl`g^l`- (, Krf`k]l]LjYad7

- Y!`9m]j]q:]Yd Z!`Bryf`dYE]f`r` [!`Bkl`f` ; `]f`
- \!`E`a`Y]dD]kcYmi]!`DgijYaf] HM]d

. &O`Y`[g`g]`ak`Bryf`dYE]f`r`r`gnk]7

- Y!`lYnh]` Z!`e`nklY`\` [!`h]jao`f`cd`
- \!`[]`Y]`gYd]!`k]Y_]]f`

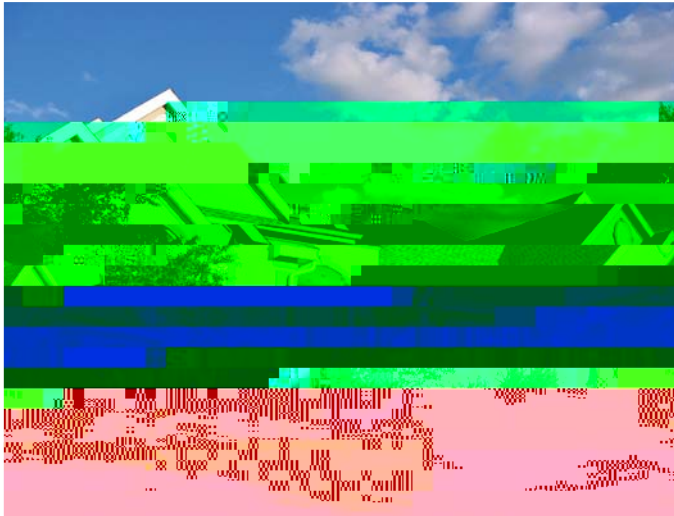
/ &O`Y`ak`E`a`Y]dD]kcYm]hjg`k]kagf`7

- Y!`[ge hml]j hjg_jYe e]j` Z!`]f`_f`]j` [!`n`jg`g`_d]
- \!`nf`a]j]k]q`e`Y`hjg`k]kagf`]!`[]`e`d]



		Family's Last Name					Occupation					House Color				
		The Beal's	The Mendez's	The Chen's	The Leiskau's	The Patel's	Engineer	Chemist	Math Professor	Computer Programmer	Virologist	taupe	mustard	periwinkle	charcoal	sea green
Address	500															
	501															
	502															
	503															
	504															
House Color	taupe															
	mustard															
	periwinkle															
	charcoal															
	sea green															
Occupation	Engineer															
	Chemist															
	Math Professor															
	Computer Programmer															
	Virologist															

Mkf_l`aklYzd`qgm[Yf `[gjj] [ldq`
 Yf ko]j`Ydtg^l`]`i nj klæg k'Ykc] \`
 f`l`k'hjgZd e &9f ko]jk'gf`
 hY_]`-/&





) & ' * & 9 ' + & ' , & ' - & <





		Restaurant					Shift					Day Working				
		Olive Garden	Carraba's	Outback	Steakhouse	Chili's	Hunan's	10am-2pm	10am-4pm	11am-4pm	12pm-7pm	12pm-8pm	Monday	Tuesday	Wednesday	Thursday
Name	Andrew	x	x	.	x	x	.	x	x	x	x	x	x	x	.	x
	Tula	x	.	x	x	x	x	x	x	x	.	x	x	.	x	x
	Randall	.	x	x	x	x	x	x	.	x	x	x	x	x	x	.
	Heidi	x	x	x	x	x	.	x	x	x	x	.	x	x	x	x
	Phoung	x	x	x	x	.	x	x	x	.	x	x	.	x	x	x
Day Working	Monday	x	x	x	x	.	x	.	x	x	x	x	.	x	.	x
	Tuesday	x	x	x	.	x	x	x	x	.	x	.	x	.	x	.
	Wednesday	x	.	x	x	x	x	x	x
	Thursday	x	x	.	x	x	.	x	x	x	x	x	x	x	x	.
	Friday	.	x	x	x	x	x	x	.	x	x	x	x	x	x	.
Shift																
	x															
	xx															
	x															
	x															





↳ ...

Some people provide valuable encouragement, guidance or inspiration, but do not

j]k]Yj[`& gf ØhYf d`a`qgnj·Pjkl[`gd]`g]kf Ø[`ggk]`qgn& gf kà.]j`
YhjgY[`d`gl`]j`e]f]gjk&Øf`a`qgm]f`nh`lnjf d`_`gof`Y[ndq]`Y`

· , & 9'e]flgj[Yf``]d'qgmif\]jklYf\T']kqk]e \$hjgn\]]f[gnjY_]e

v' 4 , 4 x v' X' t , . L . n

-) & Mf\jklYf\T\ \]e Yf\kg^o gjcfa_ 'o d']Y\ 'e]flgj&@go 'e Yf q'`gnjkh]j'o]]c'Yj] 'qgm]ph [l]\lg'o gjc7O adqgmif]]\lg\g'kge]'o gjc Yf a_ 'l'g'j gf T']'o]]c]f\k7:] knj] T']'gnjkYf\kY'lq['gf\%lagf kY]] Ykgf YZd]] dlan] lg'qgnj'gl']j] khgf kZadq k&>Yaf_ [dkk]k'Z] [Ynk] 'qgmikh] f\lgg'e Yf q'`gnjk'af T']]k] Yj['dZ'o adff gl'Z]'nq'o]\ YkYo d] ['gd] &
- * & J]Y'af 'gje Ylagf 'gf T']'h]gh [l'Yf\ Ykc'gj`] d'af 'nf\]jklYf\af_ 'd&
- + & LYc] 'f'gl]kYf\hYq Yll]f lagf 'o`]f h]ghd]Yc] lae]lg]]Y\ 'qgm]`af_k&<gf Qhj]l]f\ 'qgm]f\]jklYf\ 'g]cf go 'kge]l'af_ 'o`]f 'qgm]`gf Q&L'ak' [Yf 'd]Y'lg'e Ytgj'e adYc]k&
- , & :] knj] 'qgm]c]]h_ 'gg\]j] [g]k'af T']'gje T' Y'aknk\ 'ZqT']'dZ'Zk]]'k] [lagf 'gf < MYE Yf Y_]e]f l]&C]]h'qgnj]]Y_]f l]kS] i nahe]f l]Se Yl]j&% Yk'gj_ Yf a_]\ Yf\ 'dZ] d\ &
- & 9\ e d' e adYc]ko`]f 'qgm]e Yc] T']e \$Zni\ 'gf Qc]]h]j] e af\af_ h]ghd`g^T']e &
- . & ; ge e nf ad Yl] 'o d' 'qgnj'e]f l]gjSo`]l']j'af h]k'gf SZqf gl] 'g] Zq]]e Yab&
- / & C]]h'Yhhgaf]e]f l]ko d' 'qgnj'e]f l]gj&A'd'akæ h'gkæZd]g_]l]g'Y`e]]laf_ Sd] 'qgnj'e]f l]gj'cf go 'o` q'qgm]e dkk\T']'e]]laf_ Yki na]cd] YkhgkæZd &
- O& E Ypæ a] T']'æ hYl]g^læ]'o d' 'qgnj'e]f l]gj'Zq2
- Y]j]Y'af_ 'g]j]nq'o af_]j] d nYl'af 'gje Ylagf
- Y'g]_ Yf a'af_ 'qgnj'af 'gje Ylagf
- Y'hj] hY]af_ 'o` Y'qgm]o Yf l]g'kYq
- Y'Zj'af_ af_ [d]Y]d]dZ]d\ \Y'Yf\af 'gje Ylagf]gT']'e]]laf_
- Y'hj] k]f l]af_ Yhd]f S]n]f 'a'd'af Qh]j]l]l
- Y]Ycaf_ 'kge]'f'gl]k'kg'qgm]Y]] knj] 'qgm]cf go 'o` Yl'o Yk\] [a] \
- Y'gd]go af_ 'nh' 'o d' 'Yo jall]f f'gl] Se YqZ] 'gf d]Yk'g]f'gl] S]]d]j% Yf_ 'o` Yl'o Yk\ d]kk\ \Yf\ \] [a] \ Zqgnj'e]f l]gj'o ad]d]l'qgm]cf go 'af' ak'af gl'f]]\ \&
- 1& O gjc` Yj\ \$Zni'o gjc ke Yj]L`]j] 'e YqZ] Y'Yk]j]S] Ykaj' 'o Yq]g_]l]lg`l']_gY&
-) (& =ph]]kk'Yf 'af]j]k]af T']'o gjc&
-) & Lj]Yl'qgnj' [g% g]c]jko d']j]kh] [l'Yf\ Z] Y_ 'gg\ 'dZ] [dar] f'af]l]je k'g^c]]haf_ T' af_ klà.c&
-)* & 9d]go]f gm_ 'læ]'g] 'qgnj'e]f l]gj'lg' [jda] m] YZkjY [lk'qgm]o j]d] 'g]'hgk]]j'k'qgm]h] hY]]&



) +& Hq`Ml] flæf lg`Ynd] &A`qgn`\gf ÖY_j]] S] phj] k'qgnj`ghaf æf`af`Y
hjg^ kæg f Ydo Yq&
) , & D] l'qgnj`e] flg]`cf go`qgmYhhj] [æM] l`] læ] k]`]`] [g% gjc] jk kh] f` \`

, & <]hj]kkgf'af]d']j']']km\]fl'gj'e]flg]Yf]lgjh]g'Yj]d]agfk'ah&
9`_a`_h]j]l]f]Y_]`g^h]ghd'oad]ph]j]d'f[]\]h]kkgf'Y'kge]lae]
af']aj' d]f] &Dn]cat]Slg\Yq'l']j] 'ak`]ch'gj']ghaf'_o'd']']d']c'g^
]f]]j_q'Saf]j]k'af' d]f' Yf'\ogjc'Yf'\`gh]d]kk^']d'f'_]' Y]Y[]ge'hYf'q'
\]h]kkgf'&'qgm'l`_af'c'qgm'Y']\]h]kk]\Shd'Yk']Yc'_'o'd']kge]gf]'
o`g']Yf`]ch'gj'Pf`]ch'gj'qgn&E Yf'q'n]j'q'kn[]]kk'muk[aj'flakk'`Yn]'
]gh]\`o'd']']'ake]\d'YdhjgZde]&of']f'_f']]j'So`_g']`Y]]\`_ake'gg'k'
n]j'q']Y] ^n]d]Shd'q]\Yf'ae'hg]]f]jgd'af'`a]]f'lat'qf'_gf]'g^l']'e'gk'
e'Yf'Y_]YZd']e'Yf'af']\]h]kkan]\d']k]k&K] Ylgf'Yd'Y^]]lan]\d'g]]j'g]'
K9<Sak'df'c]\lg']pl]e]]j]khgf'k]klg'qgo']d'n]k'g^knf'd']af']o'd']l]j&
E'ad'g'k'g^h]ghd']`Yn]^gm']\]aj'Zj'Yf']n'f]]lagf'k]Yzadr]\]'jgm']'
nf]]j'k]Yf'af']']]]Ynk']g^l']aj'k'qe'h]ge'k'Yf']nkaf']_d']l']]j'Yhq'lg'
]]_n]d]]k'f'k'g]q'af'hm'Sl']f'ck]g'Yf']f'_f']]j']o`_g'c]]h'e]]lq']n'g'nk'
]]]gj'k]S]n]f']o`]f`]]^]d']]jj'z]d' &





Chapter Five: Data Management

v x ' ! , . ' ! , . ' ! , .

- ') & < g[ne] f l k l '] ' h j g [] \ n j] k S k Y e h d k Y f \ j] Y _] f l k n k] \ ' g j] p h] j a e] f l k &
- ' * & H j g n a \ k Y j] [g j \ g ^ h j g _ j] k k ' g j _ j Y f l a f _ Y _] f [a j k &
- ' + & H j g n a \ k Y j] [g j \ g ^ j] k n k Y f \ Y [` a n] e] f l ' g j ' h n Z d j Y l a g f k ' Y f \ ' g j ' h Y] f l k &

\ v x ' ! , . ' ! , . ' ! , .

- ') & L] ' a f k l a m l a g f l g ' o ` a ` Y f q k h] [a p [_ j Y f l a k Y o Y] \ \ ' g o f k Y d l l `] \ Y Y &
- ' * & .



z\Yhl)\`jge`Yhj|k|f|Ylagf`Zq`KrkYf`@Ye`a%
 lgf`SH`<`S;`Yaj`g^E`gd`[`nuj`H`qlag`g`_`q`Yf`\`:`agh`qka`kS`:`E`!
)`&`O`|`f`hgk`z`d`Snk`|`Yj`Zgnf`\`f`gl`Zggck`&`Kge`|`\`MYS`go`|`n|`j`Se`Yq`Z|`
 lgg`dj`_|`'gj`Y`Yj`Zgnf`\`f`gl`Zggc`Yf`\`Y`Za`\`|`j`o`adZ`|`f`|`|`kkYj`q&`|`
 knj`|`g`\`Y|`Yf`\`f`da`d`Yd|`f`lj`a`k&

Y|lnYdd|cf`go`f`kn\`|`flk`o`g`l`gm`|`l`|`q`|`gn\`c`|`h`mh`
 o`d`f`gje`Ylagf`o`j`d`|`f`g`f`h`Yh`j`l`go`|`d`&`L`|`j`o`g`j`c`o`Yk`Yk`nf`gj`_`Yf`a`|`\`Yf`\`
 f`|`P`|`d`f`l`Yk`l`|`j`f`gl`|`k&

*`&`LYZd`g^;`gf`|`flk`Q`gmik`gn\`d`Yn`Y`|`o`h`Y`|`k`Yl`|`|`'j`gf`l`g^`q`gnj`f`gl`%
 Zggc`Z`df`c`^`g`j`|`|`|`YZd`g^`[`gf`|`flk`&`M`kn`Y`d`|`|`|`[`gf`|`flk`Y`|`g`j`_`Yf`a`|`\`
 Zq`\`Y|`&`Q`gmik`gn\`d`f`[`d`h`|`h`Y`|`f`ne`Z`|`j`k`Yf`\`|`Y|`_`g`j`a`|`Z`q`l`|`f`a`n`j`k`
 Yf`\`h`j`g`l`g`d`k`l`q`h`|`g^`|`ph`|`j`a`e`|`f`|`S`g`j`l`d`d`g^`|`ph`|`j`a`e`|`f`l`&`|`f`gl`|`|`ph`|`j`a`e`
 e`|`f`l`k`l`Y`|`q`d`d`|`\`hn`Z`d`k`Y`Z`d`\`Y`Y`o`d`Y`"Z`q`l`|`|`f`l`j`o`Q`gmie`Y`q`o`Y`f`l`
 Y`g`h`Y`d`|`_`f`j`g`l`|`g`d`g`h`g`g`h`k`\`Y`e`a`Z`Y`k`h`Y`Y`|`f`gl`Zggc`&`M`kn`Y`f`\`Y`—

ak\aa'j]f1t' Yf t'] \Yl' g'at']]ph]jae]f1&9'fne Z]j'g^]ph]j&e
e]f]lklyc] \Yq'g'j]n]f' o']ck]lg'[gf\n]l'j'ge t'] Z]_f'f'f' _lg'
]f\&L' ak'ak'o` q'lge] d'Zk'nk] 'q'g'k]%'d' Y'f'g] Zgg'ck'g' Y'n] \aa'j]%'
]f]f'g]kZgg'ck'g' \aa'j]f]f]h'g'h] [lkl' Y'e Yq'gn]jd'h'af' lae] &A'ak'
f'g]nf'nkn'Y'd'g'j H & &kn\]f]l'k'g'o'g'c'gf' k]n]jYd'h'g'h] [l'k'kae ndY%'
f]g'm'k'd]g'e Yc] _gg' \nk] 'g'^o' Yd'lae] k'o'&

A'qgmY] 'o'g'icaf' _'g'j Y[ge hYf'q'g'gf' Y'hjgh] [1t' Yl'ak'Yf]a'ahYl] \lg'q'ad' d'
hYl]f]lYZd]j]knk'Sl']'k'q]e] 'g'j] [g] \c'] hf' _e Yq'Z] n]j'q'k]n]lnj] \lg' [ge hd'
o'd' d' _Yd]i' n]e]]f]lk'j] _Y'f' _c'] hf' _j] [g] \k'q'g'mie a' _l'o'g'ic'gf' Y'hjgh]a']y'q'
g'j' _gn]j'f'e]f]l'h'g'h] [1t' Yl'ak']n]f' 'o' d'k'a] \O'n] 'lg'f'Ylag' Ydk] [m]a'q'L']j] 'Y] Y'
f'ne Z]j'g'h' q'k'k's]ge hnl'Ylag' Yd'g' _f'] [lag'nk\ak' Yk' h'jgh] [lkl' Y'e a' _l' ^Y'd'af'lg'
Y'q' d'k'a] \O'Yl] _g'j'q'&] 'knj] 'q'gm'cf'go' t'] [gf' \a'g'f'k'g'j] h'g]l'af' _o' Y'q'gm' Yn]
\gf'] Z] 'g'j] 'q'gm'Y_j]] 'lg'kh] f' \lae] gf' Y'hjgh] [l'k'g'e] _o'g'ic' \gf'] Yl' [ge hYf' a'k'
[Y' Z] \ak'nk] \af' _]f']j]Ydl]je kl' Y'o' ad'Y'd'go' _e]e Z]j'k'g' ^Ye d'k'g'f'k' [ge e d%
l]]k]g' _nYd'h] ' go' Y'o'g'ic'] ph]j'af' [] ^ Yk'] dh] \h] hY]] 'q'gm'g'j' _j'Ynm] k'k'm'q'&
:] 'knj] 'q'gm'nf' \j]k'Yf' t'] 'de ak'g'o' ^ Y'q'gm' [Yf' l] d'l' g'k] 'j'ge]gn'k'a] t'] k]l'af' _
o']j] 'q'gm'o'g'ic' \&O' g'icaf' _gf' 'h'jgh]a']y'q' h'jgh] [l'ko' ad'f'gl' _f'l]j]] o'd' _q'gm'j'
Y [] h'Yf']] Yl'k' ^gg'd'a'q'gm' [d]j'at' _ go' 'q'gm' [Yf' j] d'l' t']] ph]j'af' [] 'q'gm'_Yf'] \
o'd' g'n]j]n] Ydf' _ [gf' \] f] la'af' _'g'je Ylag'f' &

ㄱ ㄷ ㄹ ㅂ ㅅ ㅈ ㅊ ㅋ ㆁ ㆁ

- ') & >f' \e' d'k'Yc] k&d'gg'c'g'j] j]g'j'k'g'j'ge d'k'g'f'k'f' [Yd' n'm]a'f' _'
g'j]] [g] _f' _ \YY&
- * & < g'f'gl'] j'Yk'] g'j'nk'] o' _d] %gm'&f'k] Y\ S\j'Y'o' Y'df'] t' jgm' _ o' ^ Y'ak'
Z] _f' _ [' Yf' _] \ Yf' \ _o'j'd] ^Zgn] 'g'j'af' t'] 'e Y] _f' t'] [' Yf' _] & Yl] Yf' \
_f' d'a'dl'] [' Yf' _] _f' Y' \aa'j]] f] [g'q] \ _f' c&A'qgm'Y]] [' Yf' _f' _ Y [ge %
hnl] j] j] [g] \ S]k]j'ac] t' jgm' _ t'] 'e d'k'Yc] S\ \ YZ'df' c' d'f'] Yf' \ hml'af' t'] \
[g]] [lag'f' o'd' Y' \Yl] Z] k'a] _d'a
- ' + & A [dh]] f] o' _f' ^g'je Ylag'f' t' Yl' [' Yf' _] kl']] _f' l] jh]] Ylag'f' &L' ak'ak'ie' g]] g'
Yf' Y' \d'ag'f' t' Yf' Y [' Yf' _] &A [dh]] Yf'] ph'd'f' Ylag'f' g'^o' ^ q'q'gm'ie Y'] t'] \
[' Yf' _] & Yl] Yf' \ _f' d'a'dl'] [' Yf' _] &

ㅋ ㆁ ㆁ ㅈ ㅊ ㅋ ㆁ ㆁ

- ') & : Y [c' n' u] c' l' ú

- - & C]]h\YI'nh%lg%Yl]Sc]]h'Ydlhjæ Yjq\YI'af 'Ykh] [æ]\S'
-]Ykq'lg'P'f\hd[] &
- . & C]]h'Yj]]g]\g^mf% Yf'ānōM]\ \YI&
- /& E'Yf'Yf'af \YI'g'j'Yl'd'Yk'l'j]] 'q]Yk'Yl]j'l'] [ge'hd'lagf'g'l']'hjg]]l&



-) & <aP[ndq'af'hm]af_'kge]'hjæ Yjq\YI'Y
- * & =Yk]g^e'Yf'ānōM'lagf'Sl']j] 'ak'Yl]e'hl'Ylagf'lg'Yd]j\YI'Y
- + & =Ykq'qk'k'g^YI'Yl'Yl''Yk'f'gl'Z]]f'ZY[c]\%nh
- , & ;gf'kl'Yf'lq] [\ 'Yf'_af_' [ge'hm]l'kqk]e'k'
- - & @Y[caf_'g]\nhōd]Ylagf'Z'g'k]f'kalan]'af'gje'Ylagf!'

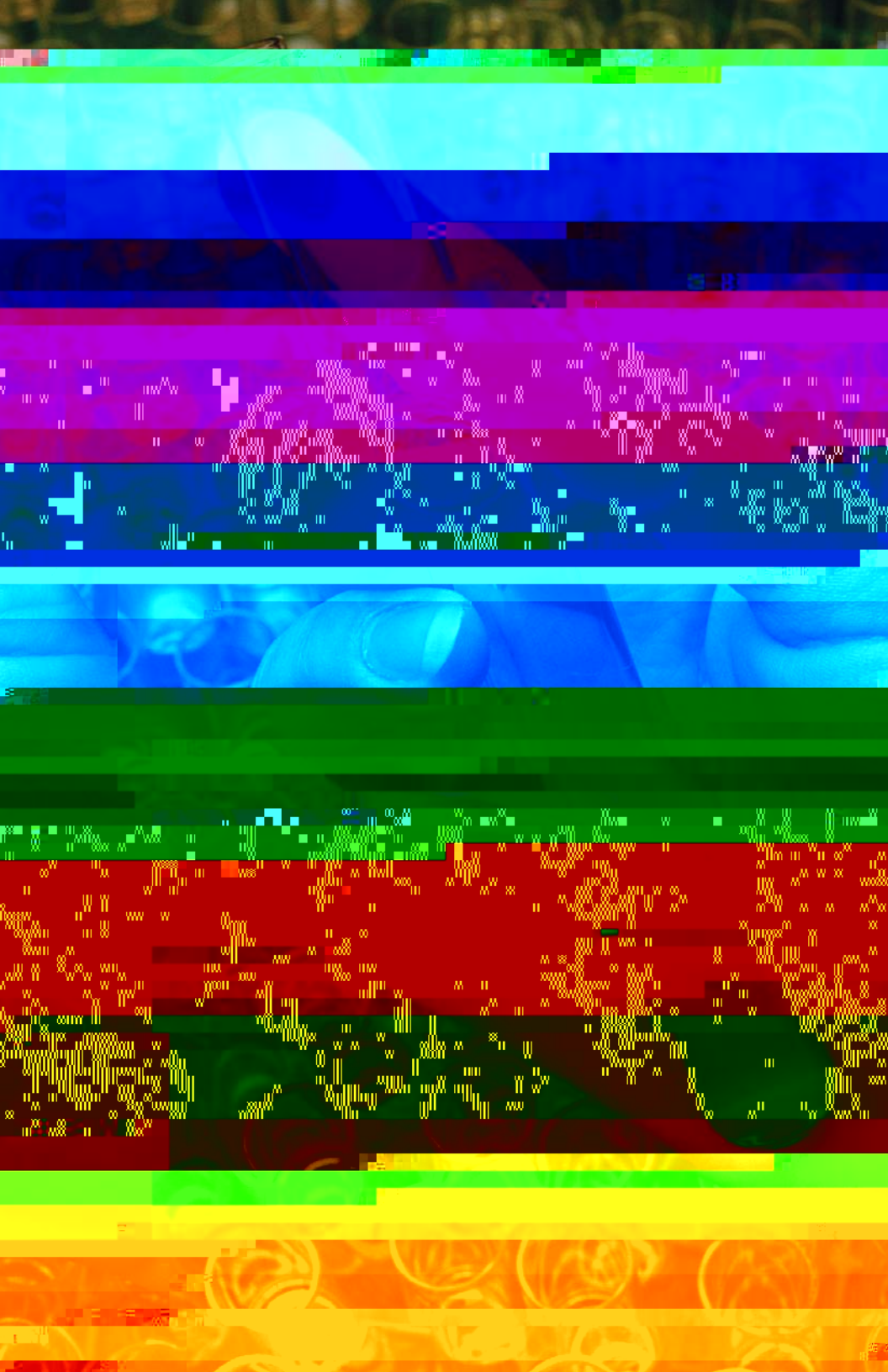


-) & <aP[ndq'nf\]jkl'Yf'af_'j]k]Yj[\
- * & <aP[ndq]j]hjg\mf'af_'j]k'ndk
- + & ÅYZad]q]lg'\g[ne]f]hjg[]kk'Yf'\hjg_]kk
- , & <aP[ndq'af'j]khgf'af_'lg'i'm]klagf'kYZgm]j]k'ndk
- - & ÅYZad]q]lg'\]f'\ [\ 'Yd]f_]k'l'Y'Y'ak
- . & Dgk]g^hn'Zd]l'jnk&@_a`'nāZad]q]Y'Yn'Sgj']n]f'k'nh]]l]'\]Y'Yn'S'
- [Yk]k'Yje'k]af[]l]j]e]f'\gnk&]k]Yj[\ 'ak'nf\]\Zq]l'Yp\gd]j'kS'
- h]jkgf'Yd[gf]jZn'lagf'k'Yf'\Zn'af']kk'l'Yl]j]d]k'gf'k'Yj]\gd]j''
- [gf]P\]f[]&O']f'h]ghd' i'm]klagf' l']''gf]klq'g^k]af'lak]kSā''
- Y'Y[]lkl']j]kgn] []klg'e'Yc] \ak]gn]j]ak'Yf'\lj'Yf'kM] 'cf'go'd_]''
- af'lg'hj'Y[l]q]Yd'Yhhd]Ylagf'k&



-) & H]gnā] YIYZd'g^[]gf]f'lk'af']Yl' Zggc
- * & C]]h'Ydlj]]g]\k'nh'lg\Yl]
- + & F'ne'Z]j]ph]jæ]f'lk'af'Yk]j]ak'af'g]j]
- , & Hh'Ydlhjæ Yjq\YI'af' l']'dZ'f'gl]Zggc'a'hgk&Zd' &Å'f'gl]S']f'hm]d'af'
- Yf']Ykq'lg'P'f\hd[]]SYf'\f'gl] l']'q]Ylagf'af'qgnj'dZ'f'gl]Zggc&
- - & E'Yc] '[gij]]lagf'k'af'Y'a'Y]j]f'l'g'q]Yf'\Yl]'af'āā'dl']e
- . & 9kc'qgn]k]d'l']k] i'm]klagf'k&
- ; gnā'qgm]nf\]jkl'Yf' l']'dZ'f'gl]Zggc]l]f'q]Yk'j]ge'f'go'7
- ; Yf'Yf'qgf] 'o'g\āf'Ŧ'g'l']]ph]jæ]f'lk]j]h]Yl']e'7
- ; Yf'qgm]b'f' l']'hjæ Yjq\YI'Yf'\e'Yl]j]ā'd'k'nk] 'lg'\g''
- l']]ph]jæ]f'lk'7





Chapter Six: Reading the Scientific Literature

9`m] hYl'g^qgnj kn[[]kkYkYj]k]Yj[`]j`\\h]f\\knngf`qgnjYZadq'lgz]Y\&



*& L]j] 'Yj] 'gnj f Yd k l ' Y l h n Z d k ' j] h] l a a n] ' g j ' l j a n a y d o g j c ' ' g h a f _ ' T ' Y i o ' ' Y ' d g g c k l j a n a y d l g \ Y q ' a k j] [g _ % f a r] \ Y k k a f a p [Y f l l g e g j j g o & L] j] ' Y j] ' ' m f \ j] \ k g ^ l g n j f Y d k l ' Y l n j q ' ' o h] g h d j] Y \ & K g e] ' l a e] k h] g h d ' k l Y l ' Y l g n j f Y d Z] [Y m k] ' T] q [Y f O _] l ' T] a ' o g j c ' Y [[] h l] \ a f '] k l Y Z d k] \ ' g n j f Y d & K g e] ' n j q h j g e a f] f l S ' a ' ' i n y d i q l g n j f Y d k Z] _ Y f ' T ' a k o Y q &

+& K g e] ' k [a f l a d k o a d l h n Z d k ' Y f q l ' a f _ ' T] q [Y f _] l ' Z q l '] a j j] n a o] j k & G ' 1] f ' Y j] k] Y j ['] j O o a k ' n o l ' a f c a f _] l k a f ' T] ' o Y q g ^ l '] a ' Y Z a d l q l g ' g Z h] [l a n] d j ' Y f Y d r] ' T] a j j] k n d k &

, & A ' g j e Y l a g f ' Y f \ j] k g d r % l a g f ' a k g ^ l] f ' d g k l ' a f ' j] h j g \ n j l a g f S] k h] [a y d i q a ^ h g g i ' i n y d i q h Y h] j ' a k n k \ ' l g h j g \ n j] ' g j ' h j a f l ' T] ' Y l a d & K g e] j] k n d k [Y f ' g f d j Z] ' k] f ' a ' h j a f l] \ ' a f ' g d j] &



Mk] ' T] j a ' l ' Y h h j g Y [' \] h] f \ a f _ ' g f ' o g n j h n j h g k l ' a f j] Y a f _ ' Y h Y h] j & g f k a] j ' T] ' g d g o a f _ ' g Z h] [l a n] k z

- Y D g g c a f _ ' g j ' ' g l \ a k [g n] j a k
- Y K] Y j [' a _ ' g j ' Y h h d l Y Z a d l q
- Y J] k] Y j [' a _ Y l] [' f a n]
- Y J] Y a f _ ' g j ' Z Y [c _ j g n f \ ' a ' g j e Y l a g f
- Y 9 f Y d r a f _ ' Y h Y h] j ' Z g] n k g f ' T] ' k g n f \ f] k k g ^ k [a f [] !



Q m i e a _ ' l o Y f l l g ' d g g c ' g j ' ' g l \ a k [g n] j a k a f ' g j \ j] l g ' c] h ' n h ' o a ' T] ' Y n Y f [[k Z] a _ ' e Y \] a f ' k [a f [] ' Y f \ P f \ Y j] Y k ' g j ' ^ n j l '] j \ n] d g h e] f l & G ' 1] f ' \ g f _ ' T ' a k [Y f ' Z] ' T] \ a ^ l j] f [[] Z] l o]] f ' Y e g \ k l Y f \ Y k c q l g [c] l a f _ [Y]] j &

D g g c h j a e Y j a d Y l c] q o g \ k Y f \ k l Y] e] f l k Y Z g n i n f a n j f] k k ' g n f \ a f ' T] ' l a d] Y f \ Y Z k j Y l & 9 d g ' d g g c ' Y l ' T] \ Y Y Y f \ \ a k [m k l a g f S k] Y j [' a _ ' g j ' o Y q k a ' [g f f] [l k l g ' o g n j ' g o f ' o g j c &

C]] h Y P d] g f ' a f l] j] k l a f _ ' a] Y k l ' Y l e a _ ' l [g f f] [l l g ' o g n j ' o g j c ' g j ' h j g Z % d e k q g m o g n d] g n] l g ' k g d h] & L] k] h Y h] j k e a _ ' l Z] [g e] ' T] ' Z Y k k g ^ Y f K > ^ l O d g o k a h j g h g k Y &



•)

Al` k'hYh]j`ogj]`e gj]`læ]7<g'Ae gn]`gf]g'YhYh]jj]`f[]\`]j]7
Q



G1]f1`dk][`fá n]`aknk]`nda`qgmYj]`kY]af_]k]Yj[``af`Yf`nf`Ye`a%
 a]`Yj]Yf\`oYf]lg`cf`go`o`Yi`Yk`Yq]Y\q]Z]]f`Y[[ge`hck]`&A`k`Ykg`Z]f]P[á]d
 `g]`kge]`gf]]`phq]af`_`Yhj]gh[l]`g]`Yj]Y`g]`nj]`j]`k]m]q&

Y& : , , J]Y`[Yj]`m]l]g`_]]1]]`Y]`dg`1`]]`hYh]j&F`gl]`c]`q`o`g]`k`
 Yf\`a`d`l`æ`hg]Yf]`hgaf]k&F`gl]`o`Y1]]`Ym]`g]k]`gf]k]j]]`lg`
 Z]1]]]á]]`gf]j]á]Zn]ag]f`&

Z& : , , :]]`Ynk]`d_]f]j]Yd]k]n]e`e`Y]a]k`á]d]gn]j]á]k]af`Y]P]á]S
 l`á]k]g]f]Y`]d]h]n]d]j]k]gn]j]]`g]`
 ZY[c_jgm]f]j]]]p` A` A`
 Z]l]af`gg]j]_` A` A` Y&` ///`



✓ , L` k'k'Ylæ]%gf kmē d _S\|Yadgja f l]\` Yf Yd|k'k'g` Pf \ Y[ge

<g`Ynl` gjk`f`YhhjghjA] d]j] ^]j] f[] `go f`o`gjc7L` ak'e]Yf k`g`
cgm]f`nh`gdgo d`_`gnj`hYh]jk]lg`_]lZY[c]lg`l` `Q]Yd]j] ^]j%
]f[] l`M]l] dkcgm`go`l`]`o`gjc`o`Yk`gf] 79d Yqk]j] ^]j] f[] l`l`
hYh]j`o`]j]`hjg[]`nj]kYj]` \]k]jZ]`&

@Yk]`]`f[] []kkY]q`Y]YZ]]]f`af`[d]l` \7
Ak]`]`hYh]j`hY\ \]o`d` `nf]f[] []kkY]q`P`nj] k7
Ak]`]`Y]Yo] d]gj`Yf`a]` \Yf` \[d`Y]d]`hj]k]f]l] \7
O]j] `YhhjghjA] [gf]lgdknk]` \Yf` \k` go f 7
O]j] [g]j] [l]l] [`f`a`n]knk]` \lg`Yf`ko`]j]l`]`i`n]klagf k7
9j] `j`Yh`k`Yf` \Y]Z]dknk]` \Yd
]]`_`Yh`^i`]qA A A

Yg`Yf`k` Aknk]` \Yf` \k` go f 7

A O]j] `YhhnjX

Q

A

C

A

A&

Q]]i`Yh]k]f]l] \7



Chapter Seven: Plagiarism and Copyright Infringement

1. The first step in identifying plagiarism is to determine if the work is original. If the work is not original, it is not eligible for copyright protection. If the work is original, the next step is to determine if the work is a derivative work. If the work is a derivative work, it is not eligible for copyright protection. If the work is not a derivative work, the next step is to determine if the work is a copy of a copyrighted work. If the work is a copy of a copyrighted work, it is not eligible for copyright protection. If the work is not a copy of a copyrighted work, the next step is to determine if the work is a copy of a public domain work. If the work is a copy of a public domain work, it is not eligible for copyright protection. If the work is not a copy of a public domain work, the next step is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection. If the work is not a copy of a work that is in the public domain, the next step is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection.

2. The second step in identifying plagiarism is to determine if the work is a copy of a copyrighted work. If the work is a copy of a copyrighted work, it is not eligible for copyright protection. If the work is not a copy of a copyrighted work, the next step is to determine if the work is a copy of a public domain work. If the work is a copy of a public domain work, it is not eligible for copyright protection. If the work is not a copy of a public domain work, the next step is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection. If the work is not a copy of a work that is in the public domain, the next step is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection.

3. The third step in identifying plagiarism is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection. If the work is not a copy of a work that is in the public domain, the next step is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection. If the work is not a copy of a work that is in the public domain, the next step is to determine if the work is a copy of a work that is in the public domain. If the work is a copy of a work that is in the public domain, it is not eligible for copyright protection.



4 . ' r p t . h . ' .

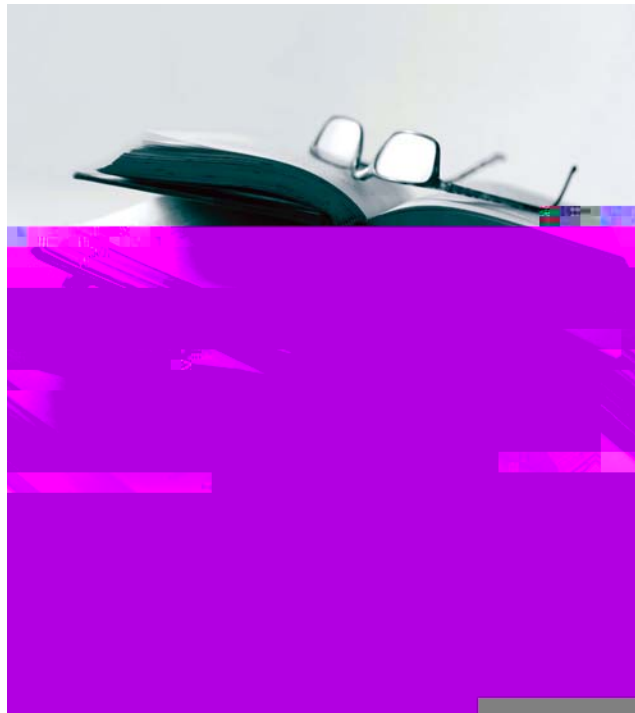
- • ¥9[[g|\d_lg'ke d`Yf\Bf]kž*!É
 - • ¥..
-



f x y z . ,

-) & ; d] 'æ hgi|Yf1 P'f\af_k&
- * & < gf Ö[d]]n]jq\` f_]n]j'ojdl]f 'gf T`] lghd &
- + & J]Y\ Ydg^T] j] ^j]f [[k'qgm[d] &
- , & ?]l'h]je dkgf 'jge T`] lgnf YdSZggc Yf\` Yn\` gkklg`nk\` Yf q[ghqja` l%]\`o gjc\$] kh] [äYdq P_nj] k&A^qgmYj] nka`_`aj] [l' ghaj kg^P_nj] k'jge`]n]f 'qgmj`go f`hYh]j`'gj`Yf gl`]j`hnZdk Ylagf`qgmie nkl` Yn]`h]je dkgf` 'jge T`]`gj`Yf`a`Ylagf T` Yl`hnZdk]\`T`]`o gjc&e]ja`Y` Yk'dó kl` Yl` hgi] [l'nk] g^hnZdk]\`e Yl]ja&

**Material in this section was adapted from presentations by Gayle Slaughter, Ph.D. and John Rodgers, Ph.D., Assistant Professor of Immunology at BCM.*





Chapter Eight: Research Proposals/Fellowships

Y - v r t \ r t v t ,

=n]f`nf\|_jYnM]ke Yq'ojd] j]k]Yj[`'hjhghkYk'gj Y'hjgh[ISYk]f'agj T]kS
 Y' dgo k' ah'Yhhd]Yagf &F K> Yf\ Y' o' k]d'f'f' l'g[d]l'kY[[]hl' dgo k' ah'
 hjghghkYk'gjge' k]f'agjko' g' [Y' T]e' nk' T]e' Y' Y' q' jYnM] k' ggd]g'o' d'`
 T]q'Yj' Y'e' d] \ z llh2'o'o o &k&gn!&E gkl' H & [Y' f\ a' Y]ko' ad]ojd] j]k]Yj[`'
 hjghghkYk'gj T]aj' i' m' d' q' f' _] pYe' k' Y' f' h' g' k' z' d' j' 'g' h' j] %g[lg]Yd' dgo k' ahk&

.....

-) & J]Ydr T]Yo` ad' ojadf _Yj]k]Yj[`'hjhghkYde a`l]k]e`
 gn]jo` |d' f' _So' d' 'gj_ Y' f' a' Yagf' Y' f' \ h] h]Yagf' Sd' \ g] k' f' o' Yn]`
 lg' Z] Y' Ynf' l' f' _Yk&
- * & =ph[[]o'jadf _Y'hjhghkYd]l'Yc] 'o' g]c' Y' f' \ h' d' f' f' a' _Y' f' \ e' Yc] 'knj]'
 qgm]Ydgo' Y' f' Y]i' nM] 'Ye' gnf' l' g' ^' l' a' e] 'g' j] Y[' k] h&L] ' d' n] dg' ^\] Yd
 j]i' n' j] \ 'o' ad] \ h] f' \ 'g' f' T] hY] ' d' f' _' Y' f' \ 'qgm] k] Y] ' g' ^ [Y] j] \] %
 n] q'he] f] f' g' g' f]] ph] [lkY[gd]_] k]f'agj' lg' o'jad] T] kYe] 'lqh] 'g'
 hjghghkYd]Yk'YH & & [Y' f\ a' Y] o'jadf _Yi' m' d' q' f' _] pYe' hjghghkYd&
- + & O`] f' Z] Y' f' k] g] e' f' _lg' P' f' \ Y] gh' d' S[g' f' k' a] j' d' g' c' f' _' f' l' g' a'] Yk' j' ge`
 [d' k' k' k' S' k] e' f' Y' k' S' g] k' g' e] l' f' _' qgm] Y' T] Y] [Ym` l' qgm] Yll] f' l' agf' &
- , & J]Ydr T]Yo` ad' d' ak' a' e' hg] Y' f' l' T] Y' o' qgm] l' gh' d' Z] ' f' l] j] k' f' _' S' qgm]`
 _g' Yk' k' g' m' d' Z] Y[' d' n' Y' z' d' &L' a' k' e] Y' f' k' qgm] e' nk'` Yn] ' Y' k' m' P] [d' f' l`
 Ye' gnf' l' g' ^' ZY[c_ jgm] \ f' g] j' e' Yagf' 'g' f' o' d' ` lg' ZYk] T] k' m' q' Y' f' Y'
 j] Y' d' k] d' h' d' f' lg' Y[[g' e' h' d' k' T] _g' Yk' & Qgm] f' g] l' hjghghk' _Y' h' d' f' T] Y'
 o' g' m' d' Yc]) (h] gh' d') (q] Y' k] l' g' \ g' T] h] gh' [l' &

.....

-) & Lqh' d] Yd] hjghghkYd' g] j' e' Y`
 z] pl] f' l' g' ^\] Y' a' k' f' [d' h] \ 'o' e
 j] Y' d' l' (l` 1A D Y V je Y





qgnj'hjgh[l'o a`gl`]jkSYf`Yn`l`e`j]Y`l`jgm`d`lg`[jda n]`qgnj`
ogj\af`&Qmie a`l`Yn`lg'oja]l`h`hghgkYdf`qgnj`f`Yan`df`nY`S
l`j`f`l`Yf`kM`d`af`lg`f`dk`&Qmie Yq]n]f`o`Yf`l`lg`Pf`Yf`g`Yf`a`Yagf`
l`Y`l`]`dkh]ghd`æ`hjgn]`f`dk`kcatk&

- & ?]l`gn]j`d`Yf`bkl`g`d`i`9`q`l`g`^`gg`
ojdf`_`Yhh]f`ko`]f`h]ghd`Y]f`O`f`l`e`gg`&G`l`f`o`Y`Yhh]f`k`k`
qgn]`cl`]h`h]g[j`Yk`f`Yaf`_`nf`lad`qgm`Yn`k`d`ld`læ`]`lg`o`ja]l`Y`qgm`
l`k]j`kk`g`n`Yf`n]f`e`g]`gn]jo`]`e`]`&Bkl`kYj]o`jad``&`j]Yl`
Yf`Ye`gh`]j`[gf`n]an]lg`hj`n]lan]o`jad`_`Zq]`e`f`Yaf`_`dk]Y`%
lagf`k`S`Ynaf`_`l`]`O`ja]l`Oj]kgnj[]k`Z`h]ghShYh]jkSYi`n`aj]h`d`[`Sl`]
ja`l`e`nk`lg`d`h`qgm]gf`[f]l]Yl`&A`qgm_]l`l`]`^`q`go`k`d`i`e`YqZ]`qgm`
[Yf`Znq]l`]`d`g`z`f`gl`gf`l`]`_j`Yf`l`S`o`a`l`]`e`gf`]q`qgnj`<`]`Yf`k`gnk`
an]`qgm]g`j`Z]f``f`nkl]agnk`Yf`_`]ll`f`_`qgnj`go`f`e`gf`]q&

. & F`n]j`o`Ya`l`gg`q`f`_`S]n]f`a`
qgm]O`gjc`Z]ll]j`mf`j`h]kknj]`O`H]kknj]`[Yf`[Ynk]`qgm]lg`bn_]`qgnj`
o`gjc`f`Y[[]n]Yl]`q&

/& H]l]f`qgnj]`_`anf`_`YlYc`Yf`kYj]lYcf`_`
f`gl]k&`d`nkk]l`]lghd`o`d`Y`j`d`f`Yf`Yn`hYh]j`g`Y`d`h]gh]j]Y`q&

O& L`]`^`Y`k`nknY`d`e`n]`o`gk]l`Yf`l`]
Y[l&O`Y`Q]l`]o`gk]l`Yl`[Yf`Yhh]f`7Kge`]gf]o`g`k]k`d`o`adl`f`c`
qgm]Y]f`gl`Y`gg`o`ja]l]k`K`S`d`Y]f`d`_`lg`o`ja]l`o`d]k`hYj]g`^`qgnj`
]n]Yagf`&F`gl`o`jad`_`o`ad]j]Y`d`f`_`a`Za`qgnj`[Y]j]h]g`_j]k`&A`f`gl`Yk`
`Y]`Yk`qgm]`f`c&



I left graduate school terrified of writing grant proposals. I'd seen faculty hide from everyone for months while they wrote proposals. It seemed like a daunting task. My post-doc mentor, Anthony Means, Ph.D., tricked me into writing a NIH NSRA post-doctoral fellowship by telling me it wasn't a real grant and that I probably wouldn't get it because it was so competitive, but he thought it would be a good experience for me and after all he was funding me. Well, he lied, at least about it not being a real grant. It was a small grant for one person to do in three years. But an amazing thing happened. As I started thinking about how to study protein phosphorylation in a totally new system to me, I started having fun writing the proposal. By the time I had completed the proposal, I had finished something that I didn't do earning my Ph.D. I had developed a logical plan beginning to end to answer a relevant biological question. My Ph.D. dissertation project had evolved so gradually and with so many dead-ends that proposing a new project was a joy. What was even more amazing was that the proposal was funded and my plans worked. The same skills that I used writing the fellowship, I later adapted to writing educational grants. Leaving graduate school I would never have imagined that some day I would write and supervise projects that garner a million dollars a year to train the next generation of scientists. Grant writing phobia – be gone!





g^)\n[Ylagf Yf \ljYaf af `af k[af [] `af _]f]jYdo a` af ZjgY\j\`ak hndf]k&F A@`q d%
dgo k` hkhYj] `Y` qZja` \] ka f \] lg`knhhgj]ljYaf af `Znl`Yj] `Y\ e af ad]j] \ `Zq Y_]f [a k
o d` kh] [a[k[af]a[_gYdk&

E gk`q dgo k` hkhjgn\] kYdYq knhhgj] &E Yf q`hjgn\] `gf d] hY] la`dkYdYqSo ` a`
e YqZ] `knhd e] f l] \ `Zq l`] ` dZ`g` _jY\ nM] `k` ggdlg`Zjaf _l`] j] [aha f l] lg`Y
kYf \Yj \ [ge h] f kYlagf &

Kge] `af [d\] `mf`k`g`ljYn] dl g` [gf`j] f [] kSknhhdq`e gf] q`z`ge hml] jkS] l] [&
Znl`f`gl` a`g`k`Sg]`hYq`qgnj`] Yd` `af`knjYf [] &

Kge] `hjgn\] `lnalagf`lg l`] `af`klamlagf` `g`h]] %g [lgjYd] [aha f lk&

NYj a k o a` `g`_Yf a Ylagf Yf \`hnjhgk] `g`^Yo Yj \&G`l] f`Y`*`q] Yj \`njYlagf &
L`] j] Yj] `kh] [a`dYo Yj \`k`g`j`l` gk] `o`j`a`f` _`a`k] j] Ylagf k&

) & Ml] l`] `o] Zi`>`af` \`df`ck`g`j` F K>`g`j`q` dgo k` hkh` Y` qgm] [Yf` Y`hhd] `g`j`af`
qgnj`k] f`ag`q] Yj &

;`] [c`o] Zkl] k`g`j` F A@`Yf \`F K>`g`j`q` dgo k` hkh`gf [] `qgmYj] `af` _jY\ n%
Yl] `k` `ggdS]]` ? J=9L`? jgnh`o] Zkl] `z`llh2`o`o`o`&Y`e [&g`_`e] e Z] jk
_j] Yl] Sg] l` gk] `g`^hj`g`k`agf`Ydkg [a] la`k] `Y` Pl`qgnj`af l] j] k k&

* & LYd`lg`gl`] jk`af` qgnj`h`j`g`_j`Ye` Yf \` \] hY]le] f l] S`a`k] nkk`ghhg] lmf`a`k`
o d` qgnj` Y`nagj &

+ & Qgnj`mf` \] _jY\ nM]] j] k] Yj [`h`j`g`_j`Ye` `g`P [] `g`j [Yj]] j [] f l] j`e` Yq` `Yn] Y
dk] `g`^q` dgo k` hkh &

) & ?] l`kh] [a[`af`g`je` Ylagf` `j`ge` l`] _jYf`laf` _Y_] f [q>g`dgo` Yd] \ a] [] lagf k&

* & :] `knj] `qgmYj]] d`z`d` `g`j`l`] Yo Yj \ `3hYq`Yll] f`lagf`lg`l`qh] k`g`^ljYaf`af` _
[gn] j] \ Slae] k`n`njaf` _ljYaf`af` _Y`dgo \ `S\] _j]] h`df`k`Y`dgo] \ S\] Y`
g`^g` [nkSj] ka] f [q`g] [da] f`k`h`j] i`n`aj] e] f l] k`Skh] [a`dhghn`M`lagf`
j] i`n`aj] e] f l] k&

+ & E Yl [` l`] `lae] `qgm] [Yf] ge e d`lg l`] `Y`hhd] Ylagf] j] i`n`aj] e] f l] k& Yf`
qgm] P`f`d` Zq l`] \] Y`a`f] 7< g] k l`] `Y`hhd] Ylagf] j] i`n`aj] `Y`*`hY_] `h`j`g`%
hgkYd`g] Y` - hY_] \] lYad` \ _jYf l7

, & E Yc] Y [`] [c`d`d`g`^o` `Yl`qgm] f [] \] lg`hjgn\] So` `a` `o`adnYq`Z] lo]] f`
Y`hhd] Ylagf k&

Lqhd`Ydaf`g`je` Ylagf`af` [d\] k`kge] `g`j` Yd`g`^l`] `g`dgo`af`_2h] j`k`g`f`Yd`



- \YYS? J=k[g] kSjYf k[jahlkS'gje 'hY_] kzo a` 'ka_f Ymj] kZq'af klamagf`
 gP[a'dk[Sd ll] jkg^j] [ge e] f \Ylagf Sdkl'g^` gf gjkSYZkjY[lShjghgkYdS
] phdf Ylagf 'g^` go 'l`] 'dgo k' ah'o adl] f` Yf [] 'qgnj ljYaf a` _g] gl` lj`
] kkYqkSdtkg^hj] k] f lYlagf k'gj` hnZd] Ylagf k&
 - & D] ll] jkg^j] [ge e] f \Ylagf 'Yj] 'Yf 'ae hgjlYf l'hYj] g^l`] 'Yhhd] Ylagf &
 L`] 'k' gl] j' qgnj` 'Yj] j' l`] 'e' g] j] n] o] j' k] d] q'g' d' ll] j' k' g' e' k' a' f' l' d' k'
 o` g' c' f' go` 'qgmYf` \ [Yf`] nYhd]] 'qgnj` hg] f' l' a' d' &
 . . J] i' m' k' d' ll] j' k' g^j] [ge e] f \Ylagf 'Y' d' Yd' g' f] 'e' g' f' l` 'a'f` 'YnYf` []`
 za` hgk' e' Zd` !
 . . A' g' je' j] [ge e] f \j' g^l`] 'f Ymj] 'g^l`] 'dgo k' ah' a' o' ja' f` _
 . . <` ah' g' e' Yd' Yd] Yk' c]] [ge e] f \j' a^`] 'k`] [Yf` o' ja] 'Y` _gg`
 j] [ge e] f \Ylagf` d' ll] j]
 . . H] g' na\] 'a'f` 'g' je' Ylagf` 'g' f' 'qgnj` 'Yj] [ge hdk` e] f l' k' z' g' ha' k' g^Y' ZkjY [l' k`
 g] hnZd] Ylagf k'
 . . >g` dgo` %h' l' g' k]] l` 'Y' d' ll] j' k' j] [] a] \\
 . & 9' h' h' d] Ylagf k' e' Yq' f]] \lg' Z] k' n' z' e' d] \l` 'j' g' m` 'Yf` 'G` P]] 'g^`
 J] k] Yj] ` So' d` 'Yh' h' j' g' h' a] l] 'g' je' k&


-) & <] n] qh' Y [gf [] hl3l`] f [d] a' q' a\] Yk
 * & ; gf \ n] l' Y d] j Ymj] 'k] Yj] ` lg' P' f \ o` 'Yl` 'Yf` O' Z]] f \ g' f]
 + & 9' k] k] j] k' g' n] [] k' Yf \ lae] 'g' j' o` a` ` lj' Yaf a` _o' adZ] k' nh' h' g] j] \\
 . . O` 'Y' g' l'] j' P' f' Yf [a' d] j] k' g' n] [] k' o' adZ] 'Yn' Y' a' d' Zd' lg' k' nh' h' g] j] l`] 'h' j' g] [17
 K' g' n' d' 'qgm] g' f' k' a\] j' a' f' n' g' d' a' f` _ [g' d] Y' z' g' j' Y' g' j' k' 7
 , & <] P' f] l`] 'k' h] [a' P] 'Yae kzo` 'Yl` 'qgm` gh] 'lg' 'Yj] [ge hdk` !
 - & O' ja] 'Yf` 'Y' Z' k] Y [l' ze' Yq' Z] j] i' n] \ 3` _gg` \ o' Yq' l' g' j' 'Yf' a'] l` 'g' m` 'l' k'] n] f`
 a' f' g' l' f]] \] \ !
 . & <] k] j' a' Z] l`] j] k] Yj] [` 'Yh' h' j' g' Y [` S] l`] 'h' j' g' Z' d' e' k' d' e' a' Y' lagf' k' Yf' l' a' d' h' Y] \\
 'Yf` \ 'Yh' h' j' g' Y [`] k] l' g' k' d' h] l`] 'h' j' g' Z' d' e' S' Y [` a' n] l`]] _g' Y' d' S' Yf' k' o] j] l`]`
 i' n] k' l' a' g' f' k'
 / & G' f]] 'qgm' c' f' go` o` 'Yl` 'qgm' i' o' ad\ g' S_] l` 'g' je' k' Yf` \ a' f' klamagf' Yd [d] Yj' Yf []`
 'g' j] 'ph] jae] f' l' k'
 O & =e' h` 'Yka'] l`] 'ka' f' a' P] 'Yf [] 'g^` qgnj` o' g' c'
 1 & H] g' na\] 'Z' Y [c_ j' g' n' f` \ a' f' 'g' je' Ylagf` l` 'Yl` d' q' k' Y' g' n' f` \ Ylagf` 'g' j' 'qgnj` h' j' g' h' g' k' Yd`
) (& ; j] Y] P_ n]] k' g' j' 'qgnj` h]] d' e' a' f' Y' q' \ 'M' Y' S' a' 'Y' d' g' o] \ 'Yf` \ 'qgm` 'Yn] 'Yf' q`
 h]] d' e' a' f' Y' q' \ 'M' Y'
) & ?] l' g' l'] j' k] l' g' j] Y \ 'Yf` \ [ja' d' n] 'qgnj` h' j' g' h' g' k' Yd`
) * & J] n' d] 'qgnj` h' j' g' h' g' k' Yd`



) + & Hggj] Y' qgnj' hghgkYd

), & J] na' o' qgnj' [`] [cdh3Pd 'Yhd[Magf 'Yf \ j] d nY l' af 'gje Magf



-
- • ¥J]nāo [jāā n] Sa`YnYadZd Slg`æ hjgn] `gnl[ge] &
 - • ¥K]f\`Ydll]j`g^Y[cf go d_e] fl&
 - • ¥J]nāo]i]i nāj]e] flk`gj`h]g_j]kk`Yf\`Pf Ydj] hgjl&
 - • ¥G nldf] lāe]lYZd`gj`o gjc`Yf`j] d nYf l`hj] k] flYagf`k`gj`
ljahklg [gf`j]f []k&
 - • ¥`z`g`l`]`o`gjc`G`j`kge]l`ā`_j]dM]\`]f`gm` `l`Yl`ā`e]]lk`
l`]]i nāj]e] flk`gj`knhhgjl&
-
- 



-
-) & 9kkne f_l`] j] \] j`cf go k'o`q'l`] j] k] Yj[` 'akæ hg]Yf l&
 - * & Mkf_ YZZj] nā]lāgf k'o d` gml` \] P f d`_l`] g`e] Yf d`_&O` a] l` ak'e Yq`
f gl`Z] f [] [] k]Y]q`'g]`Ykh] [a]d] \` Ym]d] f [] o d` Y[ge e gf `jYe] `g`
j] j] f [] Se Yf q] gl`] j` Ym]d] f [] k'o a] l] i nā] ` Y \] P f d] a] g f &
 - + & E] f lāgf d`_Y_] f] S \] j m` g]`h] g] l] a] f` o d` gml` \] P f d`_`ak Y] lāgf`
g]`nf [] lāgf &
 - , & >Yaf`_] g]`e h` Yk] ` l`] `nf a] n] f] k] k`g`^Yj] k] n] d] &
 - & >Yaf`_] g]` p] h] d] a] f` l`] `k] a] f` a] P [] Yf [] `g`^Yj] k] n] d] &



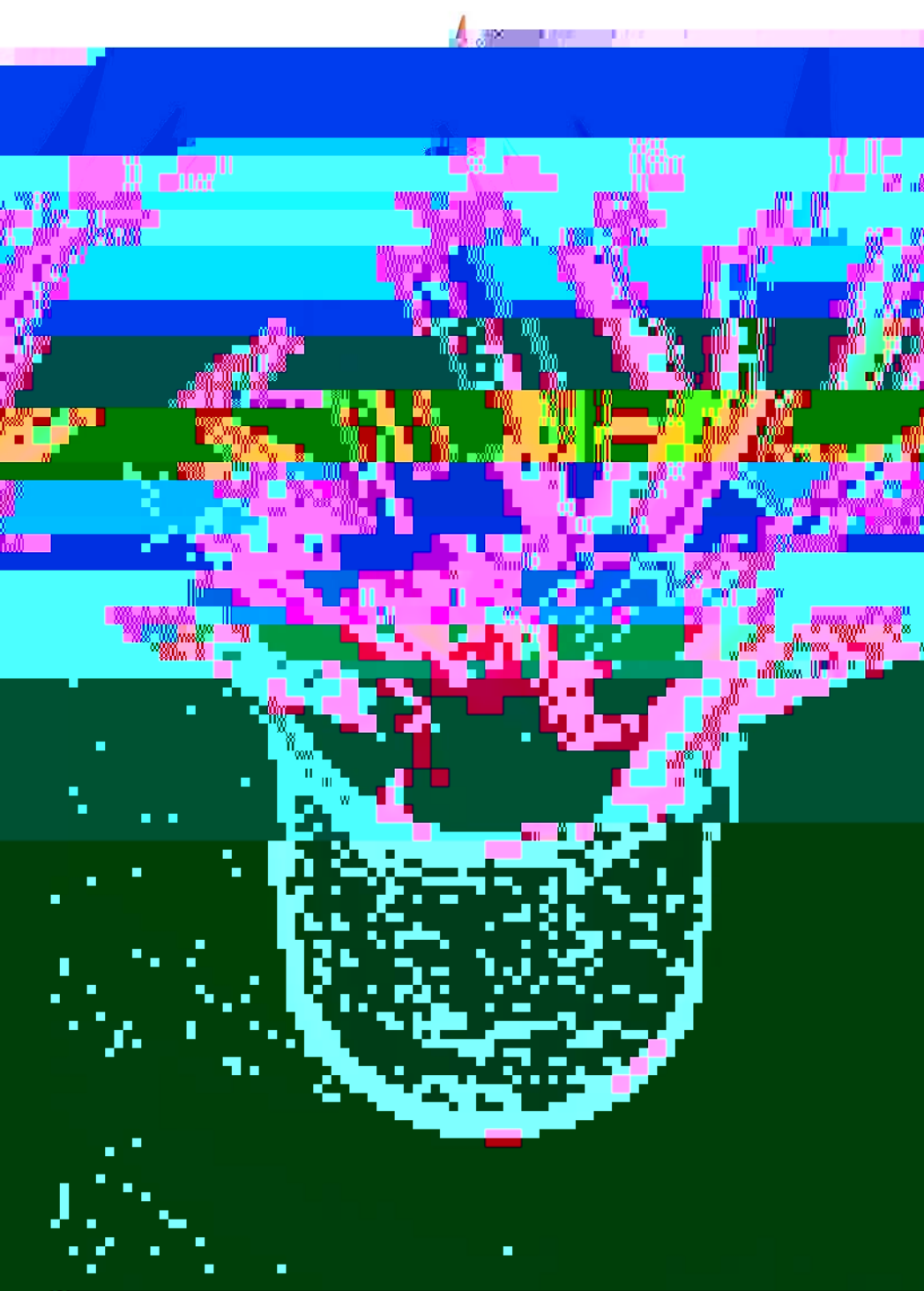




- , & Kæ 'akæ hgjlYf13[`] [c'gj'ndæZadlq'jge 'l'] ZY[c'g^Yjgge 'gj klyf\%
 f_ 'af 'jgfl'g^hgkl]j
- - & F gl'lgg [ge hd p3o Y[` 'gn]j dhhaf_ 'kqe Zgdk3[gdj] \ 'df] kYf \ kqe %
 Zgdk `] d'nd
- . & Mkl '[gdjkl' Yl '[gf ljYk' o] dBYngæ \ 'Yjc'gf \ 'Yjc ž] \ 'gf 'Zd[c!'gj 'd_ 'l'
 gf 'd_ 'l

E gkl'dZk` Yn] kge] gf] o` g'akhjgP[a fl'af 'e Ycaf_ 'P_nj] k'gf 'l'] '[ge hml]j&
 ? jYh` a khjg_ jYe k'Y] 'nh\Y] \ 'j] i n] fl' d'pSkg [`] [c'gf 'l'] 'hjg_ jYe k'g^hj] 'j] f [] &
 9\gZ] H gl'gK gh'akY[njj] fl' ^ngjd] &

A'ogmf]] \ `] d'SPf \ 'Yf] o 'jaf \ Sl'] f \ 'g'kge] l' af_ f ad] 'gj 'l'] h] jkgf 'o` g`
 `] dh] \ 'qgmd Yf 'f] o 'kacdk&E Yc] \ 'df] j'gj \ 'g'YZgjaf_ 'dZ[` gj] &L'] f 'l'] Yl`
 kge] gf]] dk] ` go 'lg'e Yc] _ J aA ~ A f



< | k a f a f _ Y f \ [j] Y l a f _ Y [d Y j Y f \ a f ' g j e Y l a n] h g k l j ' a k f g l ' g f d j Z [f] P [a d l g ' l ' g k j ' o ` g] p Y e a f] a S Z n i ' a ' a k Z [f] P [a d l g ' o g m Z] [Y n k] ' a ' e Y c j k ' o g m i k g h Y f \ ' Y k k k k l '] h j g _ j] k k Y f \ \ a j] [l a g f ' g ^ o g n j h j g h [l & C] h ' a ' e a f \ ' l '] k j l a h k o `] f ' h d f f a f _ o g n j h g k l j] 2

..b x n t ..

-) & L ' a f c Y Z g n i ' o g n j ' Y n l a j f [] ' Y f \ ' l '] a j ' Y e a d j a d o ' a ' l '] ' a f ' g j e Y l a g f ' o g n i o a d l h j] k j f l & L '] ' d k k ' Y e a d j ' o g n j ' o g j c S l '] ' e g j] ' Z Y [c _ j g n f \ ' a f ' g j e Y % l a g f ' Y f \ ' l '] ' d k k b j _ g f ' o g m i k ' g n o l ' a f [d h] &
- * & L ' a f c Y Z g n i ' o g n j ' j] k g n j [] k S a f [d h a _ 2 h Y k l \ ' Y Y S P _ n j] k j g j h ` g l g k S l g e % h n l j ' Y [a d l a k Y f \ ' h j g _ j Y e k S l '] l a e] ' o g m Y j] ' Y Z d ' l g \ \ n g l] S e g f] q ' o g m ' Y n] ' Y n Y a d Z d ' l g ' n k] & M k] ' Y d] Y a q ' h j] h Y j] \ ' e Y l j a j d o `] f ' h g k k a Z d S Z n i [j] \ a l ' g k j ' o ` g [j] Y l] \ ' o ` Y l ' o g m i n k] &
- + & :] ' [g f [a k] Y f \ ' h j] [a k] & E a f a e a '] ' o g j \ k Y f \ ' n i k] ' e g \] d k Y f \ ' P _ n j] k ' l g l '] a j ' e Y p a e n e [Y n Y [a d j o g m \ g f d] n] f ' f]] \ l g ' n k] [g e h d l] ' ' k j f l] f [] k &
- , & N a n Y d a e h Y [l Y f \ ' Y] k l '] l a k Y j] ' n j j q a e h g j l Y f l &
- & > g j _ l Z] a f _ k n Z l d N [d Y j d j k Y l] ' o g n j ' h g a f l k &
- . & Q g m Y j] ' l j q a f _ l g l] d Y k g j q o ' a ' l '] ' g d j o a f _] d e] f l k 2
 . . . a f ' g j e Y l a n] Y f \ Y l l] f l a g f %] l l a f _ Z n i ' f g l ' [n i] k q
 . . . l] d l l '] k g j q [g f [a k] d j 2 o ` q S ` g o S o ` Y l o] j] l '] j] k n i k S o ` Y l \ g l '] q e] Y f
 . . . \] k j a Z] l '] h j g Z d e ' Y f \ ' o g n j ' Y h h j g Y [` S [d Y j d j \] P f] ' o g n j _ g Y k
 . . . go \ a ' o g m \ g l ']] p h j a e] f l k 7 = e h ' Y k a r] ' e g \ a P [Y l a g f k l g ' k l Y f \ Y j \ h j g l g] g d k S n f a n j ' Y h h j g Y [] k & A [d h]] j] j] f [] k l g ' k l Y f \ Y j \ ' e g \] d &&
 . . . l '] ' e g l k a e h g j l Y f l h Y j] S h j] k j f l ' o g n j \ ' Y Y a f l '] ' e g l a f ' g j e Y % l a n] Y f \ Y] Y a d j n f \] j k l g g \ ' g j e Y l S l ']] n Y d h Y l a g f ' g ^ o g n j \ ' Y Y k g n o l Z] '] Y k j l g ' d g [Y l] & Q g m i k ' g n o l ' h j] k j f l Y f ' a l] j h j] l Y l a g f ' g ^ o g n j \ ' Y Y n f \] j ' l '] P _ n j] & E]] l a f _ k Y j] ' Z n i k Y f \ ' l '] h j j k g f ' o g m i e g k l o Y f l l g ` Y n] k j] ' o g n j h g k l j] e Y q n j j q d c] d j [g e] ' o `] f ' o g n j] ' f g l ' l ' j] & K g e] h g k l j k Y j] n h ' g j ` g n i k &

1. . h.

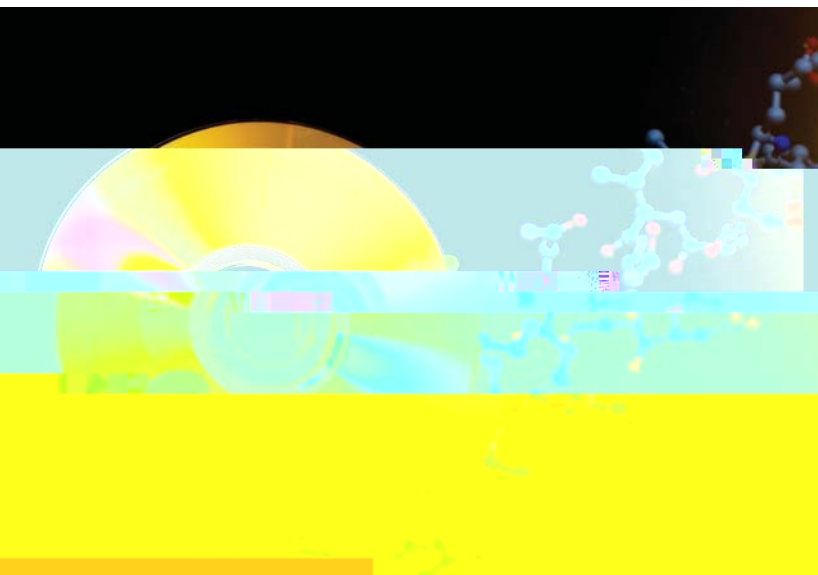
-) & : gjjgoS\gfÖkd|Yd&Mk| h` glgk\Yf\ P_nj|k'jge`gl`|j`hnZd|Magf k'gj`
h|ghd|SZn|Z|`knj|`lg_|l|h|je`dkagf`lg`\g`kg`Yf\`[d|`l`|e`&
- * & Kā`'akæ`hgj|Yf|&`|`knj|`l`|`'gfl`akj|Y\YZd`Yf\`[d`Yj`Z`O`hgaf`l`kā`|`
ak_gg\`!
- + & F|Yf|kk[gnf|lk&Qgmf|]|`2Y`hYh|j%ml|jSe`|l|j`k|ā`cS`Yl`_ne`|j`Yk|j`g|`
Y[ge`hml|j&
- , & ; d`Yj`d|`dZ|`dh``glg`_j`Yh`k`Yf`\`gl`|j`\`MY&=e`h`Ykā`|`æ`hgj|Yf|`hgaf`lk&`
- & E`gnf`laf`_`hā`|`|`k|k|h`Y|Y|`d|`Ydgo`k`e`Ypæ`ne`|β|`pāZad|c`Yf`\`j|`%nk|`&
- . & L`ā`f`c`j|`%nk|`&`qgmo`adnk|`l`|`kYe`|`ā`'gje`Yagf`g|`g|`Y`Y`'g|`e`nuldhd`
hgk|j`kSe`gnf`l`ā`g`f`|`|`Ynā`j`_j`Y\`hgk|j`Z`g`Y`\`h|je`Yf`|`f`l`d`k&ge`|`
hgk|j`k`e`Yq`Z|`h|j|h`Y|`\`Yk`Y`kaf`_d`nk|`k`|l|&
- / & 9d`Yqk`Ydgo`e`g|`læ`|`l`Yf`'qgmil`ā`c`qgmf|]|`&`Hlf`Y`|Y`&
- 0 & @Yn|`gl`|j`Q|j`dā`n|`qgnj`hgk|j`&`Yf`l`|q`'g`dgo`l`|βgo`g`ā`f`'gje`Y%
lagf`Yf`\`g`l`|q`_|l`l`|`|e`Yg|j`hgaf`lk7

/. . √ X √ X √ X X X √ X X X √ X . . √ √

Disadvantages:

¥

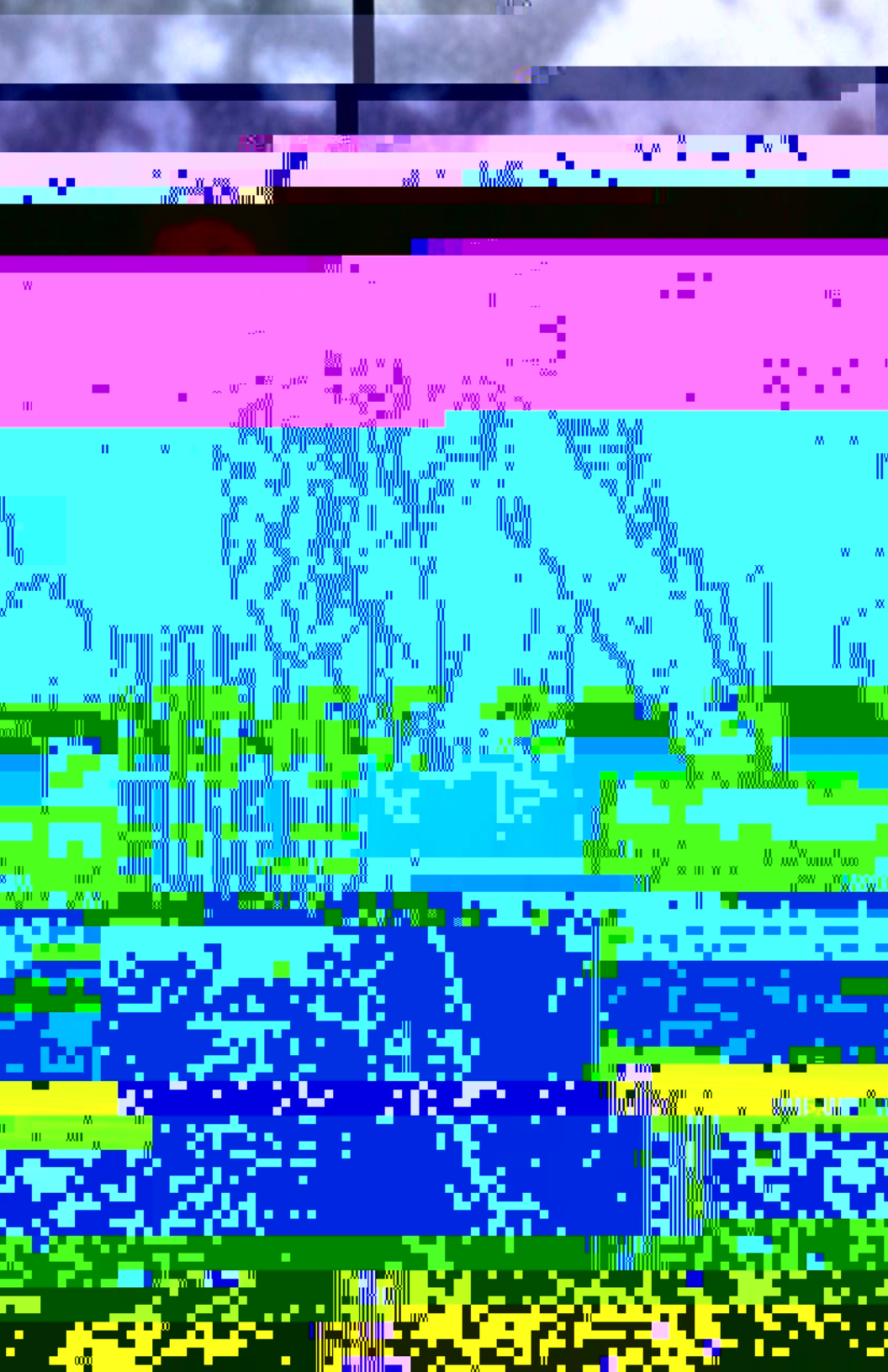
/&
 ¥? |lY\jaf c:g^o Mlj'Z| ^gj] 'qgnj'hj] k]fIMagf lae] :gj` Yn]`
 YZgld :g^o Mlj` Yf\q&
 ¥`



I met Wanda Vila-Carriles at her poster at a meeting her junior year of college. I was very impressed with her protein purification work. The University of Puerto Rico at Rio Piedras provides some wonderful opportunities for undergraduates to do research. I encouraged her to apply for the SMART Program. She would not only get to do terrific research, she could improve her English skills. Wanda did a fantastic job in the program. Then she used her SMART Program project as the basis for writing a successful fellowship proposal for graduate study. She didn't get the Ford Foundation fellowship, but she did get the NSF fellowship. And she used it to come back to BCM to continue her education.

As a Ph.D. student, Wanda initially struggled with classes, mostly due to language skills. Our IMSD grant (NIH GM56929) provided English language development and tutoring and faculty in her Molecular Physiology and Biophysics Department set up readings with her during which she would discuss papers in a one-on-one setting with faculty. Gradually, Wanda's English skills strengthened. Her science was already off to a great start. Soon after joining Joe Bryan's lab, she isolated more recombinant potassium channel protein in a weekend than everyone in the lab had isolated in two years. She created mutations for a structure/function study of this ion channel that is important in insulin secretion. Wanda was thrilled when she received perfect scores from both judges and won the Endocrine Society Award at a SACNAS meeting, but we were all ecstatic when she received the Young Investigator Award at the FEBS ABC Proteins Short Course in Vienna, Austria! How many Ph.D. students win an award as the best in the world in their field? All of the top guns autographed the book she received as the award winner. Her NSF fellowship ran out before she completed her Ph.D. project, so she applied for and received a NIH fellowship, which of course, included much more detail about her work than the shorter NSF proposal.

I'll never forget talking with one of the faculty members who worked with Wanda as she learned to read papers. He was still grinning as he told me about looking up and seeing Wanda sitting at the head table at a banquet of the editors and editorial boards of the journals of the American Physiology Society. Wanda was being "courted" as a potential post-doc by the chief editor for the journals of the society. He had invited Wanda to the banquet, picked her up in a limo, and introduced her to everybody. Dr. Reid said he finished the banquet and then realized he had to get something to eat. Every time he looked at Wanda, he smiled so much he didn't have time to eat. With Wanda's talent and perseverance and faculty who care that much about developing the next generation of scientists, it's no surprise that Wanda Vila Carriles, Ph.D. is maturing into an independent scientist that you will read about in the future.



O`aj`hnZd[`kh]Ycaf`_]eYafk`l`]fi)`Yj`g^h]ghdSa`o`adde[`d]Z]`kge]l`f`_`
qgmioad]f[gnf]l]j`af`qgnj`k`d`f`l`d`[`[`Yj]]j`Yk`qgmYj]`Yk`]\`lg`hj]k]f]l`qgnj]j`%
k]Yj[`\`o`gjc`lg`^`a]j]f]l`_jgnhk`g^h]ghd`&F]jngnkf]kkj]dM]\`lg`hnZd[`kh]Ycaf`_`k`
f`gl`gf`d]hj]nYd]f]l`f`gnad]`k`d`f`l`d`k`SZm`a`g`l]f`Y^y[`lk]ph]j`d`f`[`\`kh]Yc]j`k`Sf`g`
e`Yl]j`go`g`l]f`l`]q`Yn]`lg`_`an]`hj]k]f]l`Yagf`k&@go]n]j]S]n]j`qgf]`[`Yf`æ`hjgn]`
l`]`d`]`^y[`lan]f]kk`Yk`Y`hj]k]f]l]j`g^k`d`f`l`d`[`f`g`je`Yagf`o`d`_`hjgh]j`Ykk]k`e]f]l`
Yf`_`hjY]l`d]`Yf`_`n]f`Z]`[ge]`e`gj]`[ge`g]l`YZd`kh]Ycaf`_`g`j]`_jgnhk`g^h]ghd`&
E`Yf`q`h]ghd`Z]f]l]P]`g`je`Yl]f`_`d`_`Lg`Ykle`Yd]j`k`O`jgnhk`o`_`j]`qgm]Yf`d`Yf`Yf`_`
hjY]l`d]`hj]k]f]l`Yagf`k`k`c`k`d`f`Y`_`j`Y`n`Y`do`Y`q`o`d`_`gl`_`j`k`o`_`g`o`Y`l`lg`æ`hjgn]`l`]`d`
hnZd[`kh]Ycaf`_`k`c`k`k`&Q`m`d]n]f`e`]]]f]l]j]k`d`_`h]ghd`&

h . . . n b . . . a , . . . d . . . k

) & 9d]lYd`k`Yj]`h]j`k`m`k`an]`f`f`Y`m]j]`Yd`_`gm`_`o`d`_`k`ge]l`Yd`k`d`a`k`e`g]`
g`Zn`agnk`&L`_`d`n]d`g`^`e`gl`æf`q`gm`_`e`gf`k]j`Yl]`f`q`gnj`hj]k]f]l`Yagf`o`ad
n]j`q`_`h]f`_`d`_`gf`l`_`l`qh]`g^`l`Yd`Yf`_`l`_`Y`m`d`f`[`&





- /& A]flač'hjgZde kl' Yl'Yjgk] 'Yf\` go 'qgm\]Yd'o d` l`]e &
- O& Kne e Yja] 'qgnj' [gf [d]kaf k'gj' gZk]jnYlagf k&
- 1& < a[k nkk l`] [gf [d]kaf k'qgmio]j] 'YZd lg` \jYo 'Yf\` e] flagf l`] \aj] [% lagf l`] j] k] Yj['ak`] Yaf_ &Hjghgk] Saf`_] f] jYdl] je kS] ph]jæ] f lkl` Yl` e a` l` Z] \gf] lg` mj`] j' qgnj` o gicSo d` 'qgnj` e] flg] Œgc&

· l . j . l . . . h .

-) & Hf f a`_` akæ hgj] Yf l&
- * & <] [a] 'gf l`] 'c] q' hga' l' k' Yf\` Znad l`]] Yd' Yjgm\` d' ž`] e] &Qgnj` hgaf l' k` \g' gl` Yh] 'lg' Z] 'af`] 'jgf g' d' Ydgj\] j&] e] e Z] j l` Yl' qgnj`] l] d'f`_` Yk] gj' q' g' e Yc] l`] 'hj] k] f] Ylagf`_` d' YdYf\`] Yk' lg` 'g' d' g' o &
- + & 9 [i nāj] 'af` 'gje Ylagf l` Yl' k'nhhgj] k l`] 'hga' l' k' &
- , & Gj_Yf a`] 'af` 'gje Ylagf`_` af` Yf`] 'mj] [lan] 'o Yq' M' af`_` f gl] [Yj\` k Sgj` Y [ge % hml] j [Yf` Z] `] d' h' u&
- - & Hjg\` m]] Yf`] 'mj] [lan] 'kne e Yj' q' g`^` af` 'gje Ylagf`_` m' k' f`_` 'o g] \` kne e Yj' a] k S e g\] d' S_ j Yh` kž`] f] j Yd] h] Yk' a] j' lgj] Y\` l` Yf`] YZd k' Yf\` hā] n] j] k& Hj] k] f] l' a`_` Y e g\] do d` i m] klagf`_` e Yj' c' k' g' f`_` o` Yl' qgm\` g' Œcf go` Y



- , & Klyl' o d` Y\ i nM] ZY[c_ jgnf \ ` e Y] jã&
- - & =phdãf ` o ` Y' qgmY] \ gãf _ Yf \ ` o ` q' qgmY] \ gãf _ d' gj' o Yf l' lg \ g' d&
- . & Ml] ` nãkYãk] ^ [la] d] Yf \ hgãf l' gni' hgãf lk1'] Ymãf [] ` e a ` l' e ãk&
= ^ [la] ` nãkYãkY] 2d] _] f gm _ ` lg' Z] k] f S[ge hãl] SZni f gl' lgg'
ZnkS[d Y] d] dZ] d \ S[gãj] \ `] ^ [la] d] ãf ` Ye Yf f] j' t' Y' [d] ã] k \ Y Y'
ã k] Y \ g ^ gZk] njã _ d! &

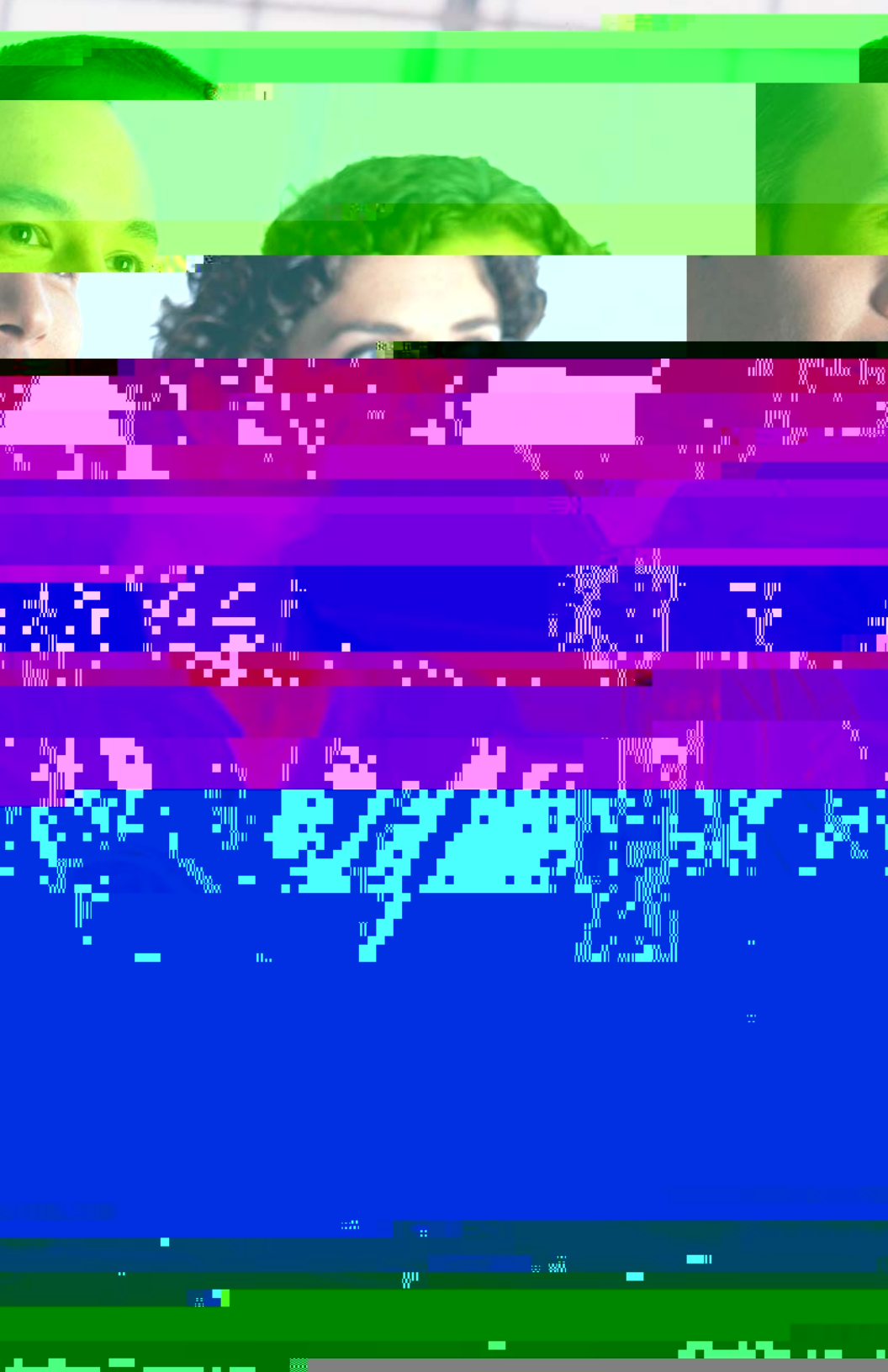


) (& 9[cf go d_] dh'o d' a' t'] [gf kjYf lk'g^læ] &Qmi[Yf 'Yb Yqk'
f [dh\] 'Ybf Ydkh] t' Y' dkl'] 'h] ghq' a' ngd\ \ a' t'] 'hjb] [l' Yf \'
Y[cf go d_] k1'] 'mf\] jk'g^l'] 'hjb] [l&

↳ . . . x . . . b . . . a . . . h.

') & :] 'Yo Yj] 'g^l'] 'e gg\ 'qgmio Yf l'lg '[j] Yl] 2hjb^l kagf YdSj] [gf [ad





¥<g'qgnj` ge |o gjc3j]Y\ kge | hYh]jk'gj`[`][c'gm'o]Zkd|kZ] 'gj`
 l`][gf'lj]f[]
 ¥?g'lg'lYckShgkl]jk'gj`p` aZa'Zgg|`kg^h]ghd`qgmio Yf1'lg'e]|l
 ¥9kc`Yf`af'l]da]f1i n]klagf
 ¥Ljq'lg_]l'qgnj`Ynagj`gj`kge]gf]'lg'af'ljg\nf]'qgmilg'h]ghd`o`g`Yj]`d'kk`
 YhjgY[`YZd
 ¥Ljq'lg'e]|l'h]ghd`gf]'gf'gf]'gj`af`Yke Ydl_jgmh
 ¥Mk]`j]]`lae]o]d%_g'o`a`Y`_jgmh'lg[de Z'O`d]`E`gnf'lyf`'gj`_g`kYaf`_
 ¥Cfgo`o`]f'lg`_an]`nh'gf`e]|laf`_kge]gf]3FgZ]dH]a]`o`af'f]jkYj]`lgm`
 ¥;`gf'ly[1h]ghd`aj][ld]n]f`a`qgm`Yn]f`oe]l1`]e 2]e YaSh`gf]

↳ ~ ~ ~ ~ ~

¥9j]Yg^af'l]j]kS[gf'ly[1'af`gje Ylagf`%]e Yal
 ¥G1`]jk'o`g`cf`go`l`]e`
 ¥H]jkgf Ydaf'l]j]k'gj` gZZa`k3kYaf`_Skcaf`_gj]ff`dS]l|&
 ¥>gdgo`ah2]`% YaS]Yj`Sf`gl]`YZgm'l`]aj`hj]k]f'lylagf`'gj`Yf`a`]Y
 ¥;`gf`f]l[Z]`'gj`l`]f]pl'e]|laf`_3YjYf`_]`lg`k]`l`]e

~ ~ ~ ~ ~

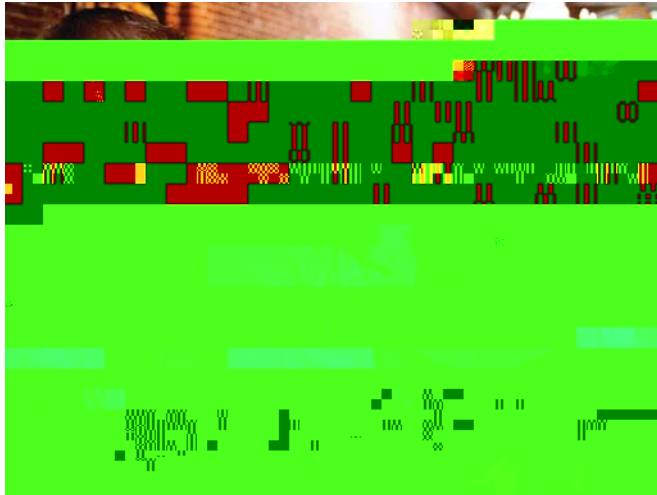
G`P[adk`Yl]j]k]Yj[`h`jg`_Ye`k'gj`_j`Y`nM]`k` `ggdk`qgmio Yf1'lg`Yll]f`_3Y_]f[ad`k`
 gj`Znkaf`kk]k'o`]j]`qgmio Yf1'lg'o`gjc`gj`klm`q
 •D]Y]jkaf`l`]`P]d`z`jYf'l]g`e`Yf`nk[jahl]j]na]o]jk3[gf'lj]f[]`'gj`_Yf`a`]jk]
 ¥>n]nj]]gd'YZg]Ygj`k
 ¥>n]nj]`e]f`lg]k
 ¥>n]nj]]g%`gjc]jk3af'l]j]na]o`'gj`lg`Zk`Y`kge]]gf'lj]f[]k
 ¥>jad`f`k`Sknhhg]l]jk

~ ~ ~ ~ ~

)&`?`Ym]`l`]`k`nYlagf`2`gje`YcS[YknYcS`_go`f`%a`_l]jgo`_q`%
 j]Yl`Yhhjghj]a]l]`d]
 *&`H]jkgf Yda]k`g^h]ghd`qgmif]]\`lg`cf`go`nY]q'o`a]`d]`jge`f`d]`
 'lg]j]Ydl]jck`
 E`Yf`q`k[af`l`d]k`Yj]`k`q3qgmif]]\`lg`e`Yc]`l`]`P]kl`e`gn]3`
 o`Yl[`Z]`af`_h`nk`q
 +&`L`]Z]kl`[gf`f]]lagf`'dk`g'l]f`l`]`k`af`[]S`Zn]f`gl`Ycb`Yqk`D`
 d`e`Yq`Z]`Y`_gZZq



, & 9hhjgY[` h] ghd
· · · ¥Kh| Yc[d Y] d
· · · ¥? gg\ gh] f a_20Aj] Ydt] f lgc] \` cgm] hj] k] f lYagf` gf &&
· · · ¥E Yc] Ykh] [aP[` [ge e] f l YZgm l`] ` o gjc` a` cgm] Yf &
· · · ¥; ge e] f lk\ gf O` Yn] `lg`Z] `hgkda] SZn] `o gj\ ` [jda` de k`
[Y] `mtt&
· · · ¥A l] g\ n]] `cgm] k] d` o d` `cgm] f Ye] SdZ` Yf \ ` o `] j] `cgm] o gjc &
- & :] YggAdWka[a e ¥A l] Q` · · · ¥A l] _ge f L` gf; YZ l`] `g] Yk] gna] `gi A] Yk] \A





Chapter Fourteen: Grad School Applications

Hj]hYjaf_Yf\`knZe daf_Yknf[[]kknnd_jYnm] k\`ggdYhhd[Vlagf `akYf `af_]jYd hYj]g^qgmj_Ye dkgf_lg_Y_jYnm] k\`ggdaf`l`]k[a f[]k]f_`f]jaf_&A[Yf`Z]`klj]kknnd@go]n]jSYje]\`o`a`Y^o`hY]l[a YdlahYf`\`]dhn`af lksf gl`gf dq[Yf`qgmh]hY] Yf`ae hj]kkan`Yhhd[Vlagf SZn`qgm[Yf`Yaf`[gf P]\f[]l`Y`d`o`add`]ch`nk`lj`qgmia`lg_Yknf[[]kknnd[Y]]j`af`k[a f[]]f_`f]jaf_`&

h. j. k. l. m. n. o. p. q. r. s. t. u. v. w. x. y. z.

-) & <g`qgmj]k]Yj[\`gf`nyagnk`hjg_jYe kSo`Yl`l`]q`Yn]lg`g^Yj`Yf`o`Yl`l`]q`qgc`g^j`af`hjgk[h][lan]`kln\]flk&Θk`^g`Y`na`l`j`ge`e`]f`lg]kS_jY%`m\]`kln\]f`lksYf`\`gl`]j`hjg^kkgf`Yk`af`l`]`P]d&` `][c`gmi`o`]Zk]k`l`jgm`]f]l]jaf`fYe`]k`g^k\`ggdSg`ljq`\`llh2`o`o`&Y`k\`ggd`k`ge`&`N`k`d`]Y`h`jg_jYe`Q`o`]Zk]k`Yf`\`[gf IY[l`l`]`h`jg_jYe`^aj`][lg]S^Y`ndq`e`]e`Z]jkYf`Y`e`f`dkjYgjk`lg`Yk`i`n`kkgf`k&
- * & ; gfka`]j`Ynyja`lq`g^Y[lk`af`fY]jgo`af`_qgmj[\`ga`]k`g^k\`ggd`k`lg`o`a`l`g`Yhhdq2
- . . . Y`Q`gmj]k]Yj[\`af]l]kkn]jknk`hjg[h][lk`YnYad`Zd`Yf`\]f`n`ajg`e`]f`l`
- . . . Y`I`n`Y`dlq`g^e`]f`lg]kYf`\]j`kgmj[[]k`YnYad`Zd`
- . . . Y`J]i`n`aj`e`]f`lk`g`j`Ye`dkgf`
- . . . Y`f`n`ajg`e`]f`l`^g`kln\]f`lk`Zk`c`[n]j]f`l`_jY`nm\]`kln\]f`lk`&Hj`g`%`_jYe`kk`gnd` `]`ch`qgm[`gf IY[l`l`]`aj`kln\]f`lk`&A`l`]q`g`f`Q`o`Yf`l`qgmil`Y`d`lg`l`]`aj`kln\]f`lks`g`qgmj]Y`d`q`o`Yf`l`lg`_g`l`]j]?
- . . . Y`Dg[Vlagf`Yf`\i`n`Y`dlq`g^d`af`d`kn]kS`[gk`g^dnaf`_j]d`lan`lg`k`h]f`l`g`f`Q` A`



- +& K]d [l'Z]lo]]f ; 'Yf \) * k` ggdklg`o` d` `lg`Yhhd&A [dñ\ 'Yn]jdlqg`
k]`ggdkSf [dñ\af _l` gk] lg`o` d` `qgm]]d]]Yf` qgmio adZ] Y [[hl] \`
Yf \ kge] l` Y`qgm]] f gl`knj] `o adY [[hl`qgm]e] j]d Yf] \n] Y] \`
kñ\] flkY]] `f _j] Y]] j \ `e Yf \ l` Yf` qgmie a` l` æ Y`_f] &
- , & 9[i náj] `Yhhd] Ylagf k'jge `o] Zk] k'g' Z'qe YaeU] i n] k] Yhhd] Ylagf `j]`
o Yaj] kSaf`qgmif]] \ lg` \ g`kg&E Yf q'hjg_jYe k'o Yaj] `j] k'g' g'f %df ` Yh%
hd] Ylagf k&
- - & ; j] Y] `YPd `g]] Y] ` `Yhhd] Ylagf &ZM] j'g] [ge hml] j Pd k'o gjcSZnl`
j] Ydr] l` Y`qgmie Yqj] [] an] kge] hYh] j [ge e nf d Ylagf `jge kge]`
k]`ggdk&A [dñ\ `Ykhj] Yk]] l` o d` \] Y`df] kYf \ j] i náj] e] flkYf \`
[] [c'd`g`^Yk`qgmiknZe d`qgm] `Yhhd] Ylagf k&
- . & ?] l` Y [ghq`g`^qgm] l` Yf k] jahl`g] `qgm] `go f` nk] &
- /& H]] hY]] Yf`gnldf] `g`^qgm] Y [[ge hdk` e] flkYf \ Y`jY] `g`^qgm] h] jkgf Yd
kY] e] fl`Yf \ j] k] Y] [`] ph] j] d f [] Sf [dñ\af _`qgm] kcadkSo gjc] ph] j] a%
] f [] SYf \ l`] `gZkY] d k'qgmie a` l` ` Yn] `gn] j [ge] lg` _] l` Yf] \n] Ylagf `g]`
f` d'] &
- O& LYc] l`] ? J =] Yd] f gm` `lg`] f knj] l` Y`qgm] Yf j] %Yc] d` a'f] [] k] Y] q&
- 1& E]] l` o d` `Yl] nk] \ `^Y [nld`q'e] e Z] j `o` g` [Yf `] d` qgm] nYdM] `qgm]`
hjg_j] kYf \ _an] `qgm] Ynd] `g' `qgm] k] j] f _l` kSkge] læ] k'hgf l` gn]`
qgm] `o] Ycf] k] k] k&
-) (& J] i n] k] d] l] j k'g`j] [ge e] f \ Ylagf `jge `h] gh d `o` g` [Yf] nYdM] `qgm]`
kñ\ YZadl`q`g`j _j YnM] `kñ\ q&A`qgm` Yh] \gf] j] k] Y] [`g] `o gjc] j] d] \`
] n] f `nY`_m] d] lg` qgm] P] d `g`^kñ\ qS_] l` Y` d Yk] gf] j] j] f [] `jge `qgm]`
e] f] lg] `g] `kñ\] n&gj&E nldhd] j] j] f [] k'jge `h] gh d `o` g`o] j] e] f %
lgjkY]] n] f Z] l] j &A`qgm` Yn] `f gl` Z] [ge] Y [i nYf l] \ `o d` `hjg`j k'g] k
f` YnYf [] \ [gn] k] kS`g` d` f go] D] l] j k'jge `Y] Y [] j` f` Y + ((`kñ\] f l`
g] _Yf d` [dñ\k] Yf `n] j q` d] d Snf d k] l`] l] Y [] j` cf go k'qgmio] d&E Yf q`
_j YnM] `k]`ggdk`gnldf] l`] [`Y] Y] l] j k] d k] l`] q'o Yf l] j] [ge e] f \] j k] g`
Y \] k] f` l`] j` d] l] j k] So `d` `qgm] Yf `hjgn\] &? an] l` gk] `o j] d` _`qgm]`
d] l] j k'gnldf] k'g`^qgm] Y [[ge hdk` e] flk&H] gn\] `f`g] e Ylagf `g' f \] Y %
df] kSkYe h] \ Y \] k] \] f n] qh] k'g] `f`g] e Ylagf `g' f `go `lg` knZe d`
d] l] j k] d] l] j g' d` Ydd&

k t h . . . v ^

-) & 9hhd] Yf l`gZ] Yf k`Yhhd] Ylagf `hYh] j`g`o] Z%ZYk] \
- * & 9hhd] Yf l` [ge hd] l] k`Yhhd] Ylagf `Yf \ j] i n] k] kYdte Y] j] a'dkZ] `k] f l
- + & ; djc Z] _f k`YPd l` Y`Yhjg_jYe `aj] [lg] `g] `Ye f` d] j Yg] e Yqj] n] d o



· , & ·

- [YnlagnkYZgn]e]flgaf _'akn]k'qgm\gf Ōo Yf l'lg \ak]nk&Gf [] 'qgm jYak] Yf 'akn] Sd Z] [ge]kY^Yj lghd 'gj i n]klagf k&
- & O Yl ['qgmj Yh] [lan]kN] gf] 'ogj \ [Yf [' Yf _] '] ' o ' gd 'æ hY]l&O gj \k' d&] ŌhYk&gf ŌŌ ' jatŌŌ ge e dl] \ Ō' Yn] '] ā h d] ' āf Yh]jkf YdkYl] % e] flSa^qgmj Y] l&gf kZY [cmh^qgmj [d'æ k&E Yc] 'knj] 'qgmj \] k]jhl&gf 'g^ qgmj]k d'e Yl ['] k] '] ^Y]lk&gj] pYe hq S \ gf ŌkYqSŌA' Yn]] p] [d] \ Y] Y% \] e ā Yd] Ōo '] f 'qgmj ? Hō 'akY+& &Z] kSYkml] fl \ 'ā kYq] ' YSo ' ā '] j] d] \ Y d [c ' g ^ n f \] j k Y f \ ' ā _ ' g ^ l '] k Y f \ Y j \ k ' g ^ H & & h j g _ j Y e k &
- . & ; '] [c ' qgmj _ j Y e e Y j Y f \ kh] d&f _ Yf \ ' e Yc] 'knj] 'lg'nk] Y] [lan] ngd] ' k] fl] f [] kZ] [ge hd] \ É SA] gf \ n] \] \ É ! & ?] '] d i o d ' _ j Y e e Y j ' ā qgmj f] \] ā Szn] hYq Yll] fl&gf Yf \ ' d Yf ' jge '] '] ' ā h m] ' qgmj] [] an] & & gf Ō bnd] j] d] gf ' kge] gf] '] d] ' lg' Pp' qgmj ' e d k Yc] k&E Yc] 'knj] ' ā k [d Y j ' o ' Yl ' qgmj ' Yn] \ gf] Sd Yj f] \ &
- / & @Yn] ' gl] jkz&f [d&ā _ ' Y] n d q ' e] e Z] jk] [j d ā n] ' qgmj] h] j k f Yd ' kYl] e] fl&
- O& J] nk] Szn] \ gf ŌgZk] k'gn] j ' o j d ā _ Yh] j ^] [l h] j k f YdkYl] e] fl& Qgmj _ gYd&lg' o j d] Yf] kYq] ' Y [Yf Z] Y [n j Y] d n f \] j k g g & L ']] k Y q ' k' g m] Z] ' qgmj ' o g j c S [d j ā] \ Z q [ge e] f l k ' jge ' gl] j k & e Yhg] j] Ykgf ' l] q Y \ \] '] Yf Yd] ā Ydo j d ā _ [ge hgf] fl' lg'] ' ? J = k Z] [Ynk] ' kg ' e Yf q'h] ghd ' Y ' kg ' e n] ' '] d i ' ā ' o j d ā _] '] ā h j k f YdkYl] e] fl k] ' Yl ' _ j Y n M] ' Y] n d q ' o] j] n] j q \ ' ā k Y h g f l] \ ' ā '] ' \ d j] h Y f [q Z] l o]] f ' o j d ā _ gf '] '] k Y q k Y f \ ' o j d ā _ h] j ^ g j e Yf [] ' ā _ j Y n M] ' k] ' g g &

→ . 4 3 . . / v 1 - 4 . 1 . . (6)

L] \] k]jhl&gf 'g^qgmj hYk] j] k] Yj [' ' o g j c] p h] j ā f [] ' ā k Y n] j q ' æ h g j Y f l h Y] ' g^qgmj Ynhd] Yl&gf 'lg' _ j Y n M] ' k] ' g g d Y f \ [Yf ' '] d i qgmj g f ' Yæ g k] Yf q Ynhd] Y% l&gf & L Yc] '] ' l æ] ' lg' o j d] Yl ' g j g m ' Yf \ n f Y e Z a n g n k \] k]jhl&gf 'g^qgmj] p h] j ā f [] k & A ^ qgmj ' Yn] ' e n d ā d] j] Y d ā]] p h] j ā f [] k S q g m i e Y q ' o Y f l ' l g ' d d l '] e S Z n l '] f ' g [n k ' g f ' g f] ' Yl ' ā k] ' ' e g k] j d n f l ' l g '] ' h j g _ j Y e ' l g ' o ' ā ' ' qgmj Y] ' Yh% h d ā _ g j '] Yl ' k ' g o k q g m j _ j] Yl] k ' d n] d g ^ Yl ' ā n] e] fl' g j ' ā] h] f \] f [] & Q g m i e Y q ' f]] \ l g j] ^ j l g ' f g l] k g j Y Z k j Y l k l g j] ^ j k ' qgmj ' e] e g j q &

Y; gf [d] ' ā k Y n] j q ' æ h g j Y f l h Y] ' \] k]jhl&gf
 Y = n a] f [] '] Yl ' qgmj n f \] j k g g \] '] h j g h] [l & A [d n] '] ' k a f ā %
 [Yf [] ' g ^ l '] ' o g j c S l '] _ g Y k ' g ^ l '] ' o g j c Yf \ ' ' g o ' qgmj [g f l j ā Z n %
 l&gf] j d] \ l g '] '] _ g Y d &



¥O`Y'qgmqYf|\So d`gnl'h`a`kgh`a`f`&

Bkl`]phd`f`o`Y'qgm\à.&

¥=pYe hd`k`g`l`|`f`a`n`khjg`|\`n`k'qgmink`|\`Yf`qgnj`

¥e`a`j`a`q`o`d`l`]e

9`\\k`j`h`l`g`f`e`a`l`k`Y`l`o`d`S`O`k`Y`[`g`f`k`i`n`j`f`[]`g`^`e`q`k`l`m`a`k`g`^`
`|`f`|`]`p`h`j`|`k`g`f``n`j`f`_`k`h`|`j`e`Y`g`_`|`f`|`k`k`S`A``Y`n`|`Y`Z`|`|`j`n`f`\\`|`j`k`Y`f`_`f`_`g`^`_`g`o`l`g`^`
|`p`l`j`Y`|`J`F`9`j`g`e`|`|`d`k`Y`f`_`|`g`f`_`n`l`l`^`q`Z`j`a`a`Y`l`g`f`|`]`p`h`|`j`a`e`|`f`l`k`S`f`[`d`h`l`f`_`in`situ`
`q`\\`j`a`a`Y`l`g`f`&`A`|`n`|`g`h`|`\\`d`_`l`e`d`j`g`k`g`h`q`k`c`a`k`Y`f`_`a`e`h`j`g`n`|`\\`e`q`c`f`g`o`d`_`|`g`^`
Z`Y`k`|`k`Y`l`a`d`a`Y`d`Y`Y`h`k`k`O`L`|`f`|`p`h`Y`f`_`l`^`|`\\`k`j`h`l`g`f`l`g`f`[`d`h`|`e`g`j`_`|`|`Y`a`k`L`|`
j`a`_`l`^`|`Y`a`k`o`a`d`|`Y`f`_`q`g`m`Z`g`f`n`k`h`g`f`l`k`%`g`|`~`9` .a` ` `



Your research/work description can make or break your graduate school application. Having excellent grades won't matter much to a reviewer if you write three sentences about your research/work experience. Don't laugh – I've seen students who submitted no more than a few nebulous lines about their research. Even if your mentor has great things to say about your work, you need to convey what you did, what you learned, and what it meant.

I know of cases when a student's grades were less than stellar and GRE scores were not strong, but whose research description was so strong and reflected such interest and commitment that faculty took the time to read letters of recommendation carefully. One such student was invited for an interview and wowed everyone. Her knowledge and enthusiasm were evident. The program decided to give her a chance. Once she was taking courses in the field she loved, her grades improved, her research was outstanding, she received a national fellowship, and became a leader in her Ph.D. program. She was not only selected as her program's most outstanding Ph.D. student,



Chapter Fifteen: Grad School Interviews

Part II: Interview Preparation

interview questions and answers

Interview questions are often asked in a structured manner. The interviewer will ask a series of questions, and you will provide answers. The questions are designed to assess your knowledge, skills, and personality. The answers should be clear, concise, and relevant to the questions. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance.

The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance.

The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance. The questions are often asked in a structured manner, and the answers should be prepared in advance.

15.1 Interview Preparation



- *& H]hY] YkY]e]f]SZn\`gf Öj]`]Yk] `a`dc] `Yk]jhl& g`Y]o `È g[cÓ
f]l]jnd] o k`o d` `Y]ndq`jge `qgn] go f `k` gg&] `knj] l`]q`_a] `qgm
]]\ZY[c`gf`o`]l`]j`qgmY] `Yf ko]j`f`_ i m] klagf k[d Y]d] Yf`
Yhhghj]d] d&
- +& O`]f`qgme Yc]]jYn] dYjYf_]e]f]k]l]q]lg`_]l`_gg\` Yá`Y]kYf` a`
kge]l` f`_`Y]ak]k]` Y`o`adl]` Yf`_]`qgn]`k`]\`nd] S[gf]Y[1`]]`h]g`_jYe`
Yk]ggf` Yk]hgk&Zd` &A`ak] ph] f]k]n]]g`Z]f`_`k]n]]f]k`f` `g]`f]l]jnd] o k&
H]g`_jYe k`o`ad]Yhhj]]d]]qgn]`Yl]]f]lagf`]g`l`]á`Zn]_]lk&
- , & H]c`gmlShnj[` Yk]`g]`Zgj]go`]q]l`]k]` Y]Y]]f]]YS[ge`^gj]YZd` Yf`
h]g]k]k]g] Yd]Zn] d]k]g]e Ydl` Yf` Yk]n]&E` Yc]]knj]]g`o`]Y]k`g]k]` Y]Y]`
Y.]i`n]Y] d]Z]gc]f` f` Yf`]ge`^gj]YZd] & gf`Ö`]k]Y]]g`Zgj]go` l` f`_k
]ge` kge`]gf]]qgme Yq]f]gl] go f` Y`o`f]l]j`]g]YS`_q]n] k]g]k]]j]n] k&E` gk]
f]l]jnd] o k` Yhh]f` Y]l]j`l`]` g`d]Yk&?` a]]j]d]f`k]Yf`]j] d]a]]k]Y`Ö` k`
d]k]Óg`o` Y]qgme a`]f]]\`g]`f]l]jnd] o]j]d]Yh` k` g`



- , & :] 'knj] 'lg:] e h` Yka` 'qgnj] k]j] f_l` k'Yf\`] ph]j] d f [] &
- - & < gf Ōlj] q] lg: ŌZdn' Ōgj] hj]]] f\` 'qgm] cf go` Yf ko] j] lg' i n] k] agf k&AŌgcYq`
lg' kYcSŌ\` gf Ōcf go ŌZn] S Pf ak` 'o d` Y[ge e] f l]] _Y] \af` _o` Y' 'qgm`
e a` l` g] lg' Pf \ `] ` Yf ko] j] &
- . & :]] Y\` q] lg` \` ak] nkk'qgnj]] k] Y] [` 'o g] c' af` l]] je k g^o` Y' 'qgm` \` a` Yf \`
o` q' d' o Yk' zh] g]] f l a' d] h] 'æ h g] j] Yf l & D] l` 'qgm]] f l` nkk'æ k` go 3a' l` ak' k`
n] j] q' \` a' P[n] d] S qgm]] Yf` e] f l agf ` ` go` e n] ` 'qgm] o g] c] \` Yk' Yf`]] pYe h d] ` g^
[ge e de] f l &
- /& ; ge e] f l] gf` l`] ` af]] j n] d] o] j] Ōj]] k] Y] [` Sa` hgk' k' Z d] & Ōk' i n] k] agf k' Se Yc]
[ge e] f l k & g' Z]] qg' f \` S ŌL` Y' l' g n] f \` k' af]]] k] af` _Ō' A' qgm]] Yk] i n] k] agf k`
Y Zgn] ` g'] [j] d] d] ak' e k' g' ^l`] ` o g] c] S Z]] h] j] g'] k] agf Y d] Yf \` h g d]] &
- O& A' qgm] cf go` l`] ` af]] j n] d] o] j] S \` gf Ō Yk' n] e]] l' g g' e n] ` 'Ye ad] j] d] q' S Z n]`
\` gf Ō Z]] 'knj] hj] ak] \` a' l`] ` Yle gkh`]]] ak' k' h` l' d] e g]] j] d] p] \` & A' qgm] ` Y`
Yhj] n] agn] k' [gf β] d] l' o' d'] ` l`] ` af]] j n] d] o] j] S [gf l Y l]]] h] j] g'] Ye ` \` q]] [] lg] ` lg`
] ph d] af` l`]] k' am] Y agf &]] i n] k] Y [` Yf` _] ` af` af]] j n] d] o] j] Sa' f] []] k] k] Y] q &
- 1& :] ` gf] k] S Z n] ` qgm] ` gf Ō` Yn] ` lg]]] n] Y dh]] j] k] gf Y d] af` ^g] e Y agf S n] f d] k] k' qgm]]
Y Yk] \` l`] ` ak' n] ` ž] d] c` e Y] j] a' d] k] d] Y n] k' Sh Y]] f l` gg' \` Sa' f]] k] k' af` 'qgnj` Y h d]] Y %
l agf & A' ak' ad] _ Y d] g' Yk' i n] k] agf k' l` Y]] β] [l` \` d] k] j] æ af` Y agf & E q] h]] j] k] gf Y d



- e gj] [ge 'gj]YZd 'kh]Ycaf_&@]j] 'Yj] 'kge] 'lakh'gj'k'q]j'h]ghd'gj't'gk]'o`g'Yj]'
nf [ge 'gj]YZd 'lYcaf_'YZgm't]e]k]d]k&
- ') & @Yn] 'Y]jnk] \ 'Y[n]dq e] e]Z]j] n] o 'cgnj'Y[[ge hdk' e] f]lk'Yf \ `] d']
qgm] \] f]l]at'q'cgnj'k]j] f]_l' kSYZad] k'Yf \ nf a n]] 'ph]j]a f] [] k&H]gn] \]
l'] e 'o d' t] ' f ' g'je Y]a f] '] q' o ad] f] \] 'lg'Z]a f_'gm't] 'k]jg f]_k]h'Y]k
g^cgnj'Y]hd] Y]a f] &
- ' * & < g' Oh]Y[] l] d] O] a f] l] j n] o k' o d' 'k] n] j Yd] h] ghd' & 9k' t] e 'lg' a f] j] Yk] t] '
a f]] f] k] a q' g' t] ' a f]] j n] o k' Yk' cgm]_ l] [q] k] j 'lg' t] '] j] Yd] a f] j n] o k &
- ' + & E Yc] ' Q `] Y] k]] l] k' O' d' ' a e h] j] Yf] a f ' g'je Y]a f] 'YZgm't] 'k] 'ggd'Yf \ '
cgnj'k] dSYf \] j] n] o t]] e 'Z] 'g]] t] ' a f]] j n] o 'k] Y] k &
- ' , & :] 'Yk] h]] h'Y] \ 'Yk] h] k] a Z] d] 2] ' a k' a f] j] Yk] k] [g f] \] f] [] &
- ' - & 9 \ b] k] 'cgnj' e] f] l] Yd] l] a n] \ 'Yk' cgm] ' f] l] j] t] ' a f]] j n] o & K]] t] ' h' g a f]] j k
nf \] j ' O] h] q [` a f _ M] h] g' k] n] []] \ O] a f] ' Yh]] j] l] o g &
- ' . & < g f O] d] l] g m ` i n] k] a g f k' j a `]] f ' cgm & g' t] ' Z] k] cgm] [Yf] l] g' Yf] k] o] j '
] n] f ' a] P [n] d] i n] k] a g f k &] Yd]] t] Y]] n] j] q g f] ` Yk' d e d k & L] ' a f]] j %
n] o] j ' e Yq] Z]] j] q f ' _ l] g] P f ' cgm] d e d & O] f] n] j ' g] _ l] l] Y] c a f _ o d' ' Yf '
Yd] e f n] k' g^cgnj' kE 9JL k' n e] e] j] j] k] Y] [' h] j] _ j e 'YZgm't] g' a k' a f]] j %
n] o k & L] ' a f]] j n] o] j] t] ' Yd] f _] \] n] j] q] k] Y] e] f] l] '] e Y \] & K]] j] Yd]]
h] n] k] \ \] Y] ' l] g' k] '] go `] ' o g m] \ a k] j]] ' o d' `] j & L] ' a f]] j n] o '] n] f '
] p] f] \] ' l] g' l] o a] t] ' Yd] h] l] \] l a e] & @ go \ a ' k] ' k] g] ` a e 79 h h] Y] f] l] d]
n] j] q' o] d & @] ' o Yk] Y []] h] \] Yf \] e Y] j] a n] d] \] t]] j] &

... v t . h .

9d` gm` t] ' o g] a f ` e Yq' n] Y] q] S e Yf] q' a f]] j n] o] j] k' o ad] Yk' i n] k] a g f] k] d] a f _ l] g'
t]] k] t]] e] k &

- Y L] d] e] 'YZgm't] cgnj' h]] n] a g n] k' j] k] Y] [` ' o g] c] '] ph] j] a f] [] &
- Y O ` q \ g ` cgm] o Yf] l] g ` _ g] l] g ` _ j Y n] d] ' k] ` g g d' O ` q \ g ` cgm] f]] \] YH & 8
- Y O ` Y] Y] ' cgm] ' q] f _ %] j e ` _ g Y d] 7
- Y O ` q \ g ` cgm] l ` a f] c' cgm] o ad] Z]] k n] []] k k' n] d] a f ' cgm] ' [` g] k] f [] Y]] j] 7
- Y O ` Y]] ph] j] a f] [] k ` Yn] ' h]] h'Y] \ ' cgm] ' g] j _ j Y n] d] ' k] ` g g d' 7
- Y O ` q] Y] ' cgm] a f]] j] k] \] a f ' g] n] j] h] j _ j Y e 7



¥O`Yl hJgb [lkYlljYl'qgm'gj`akkljYlagf j]kYj[`Yf\`o`q7

¥O`Yl YjYk\g`qgmil`f c`qgmf]]\lg`klj]f_l`]f7z^l`jj`Yj`gZnagnkYj]Yk`
.....'jge`qgmj`YhhdYlagf`l`]q'e YqYk`YZgm'l`]e`kh] [f[Yhd&

¥@go`g`qgm\Ydo d`h]ghd`o`g`Yj]`a^j]f'l`jge`qgm7

¥O`Yl`g`qgmil`f c`o`adlZ]`Yj\`YZgm`_jY\`nM]`k`ggd7

¥O`Yl`Yh]`qgmf gl`lgd`e`]`qgmio Yf l`lg`Z]`knj]`Acf go 7

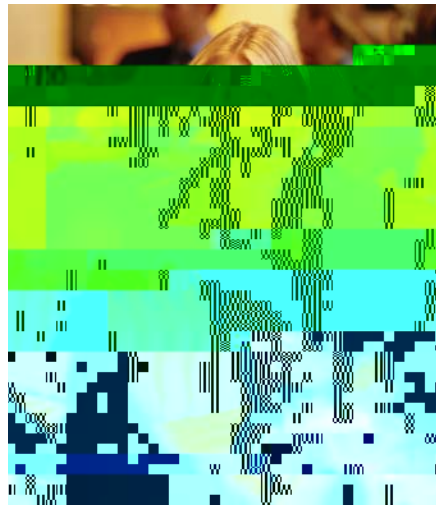
¥O`Yl`i`n]klagf k`g`qgm`Yn]`YZgmE`gmj`hJg`_jYe`Se`qj]kYj[`S]l[&

J]e]eZj2.

.....

.....

.....

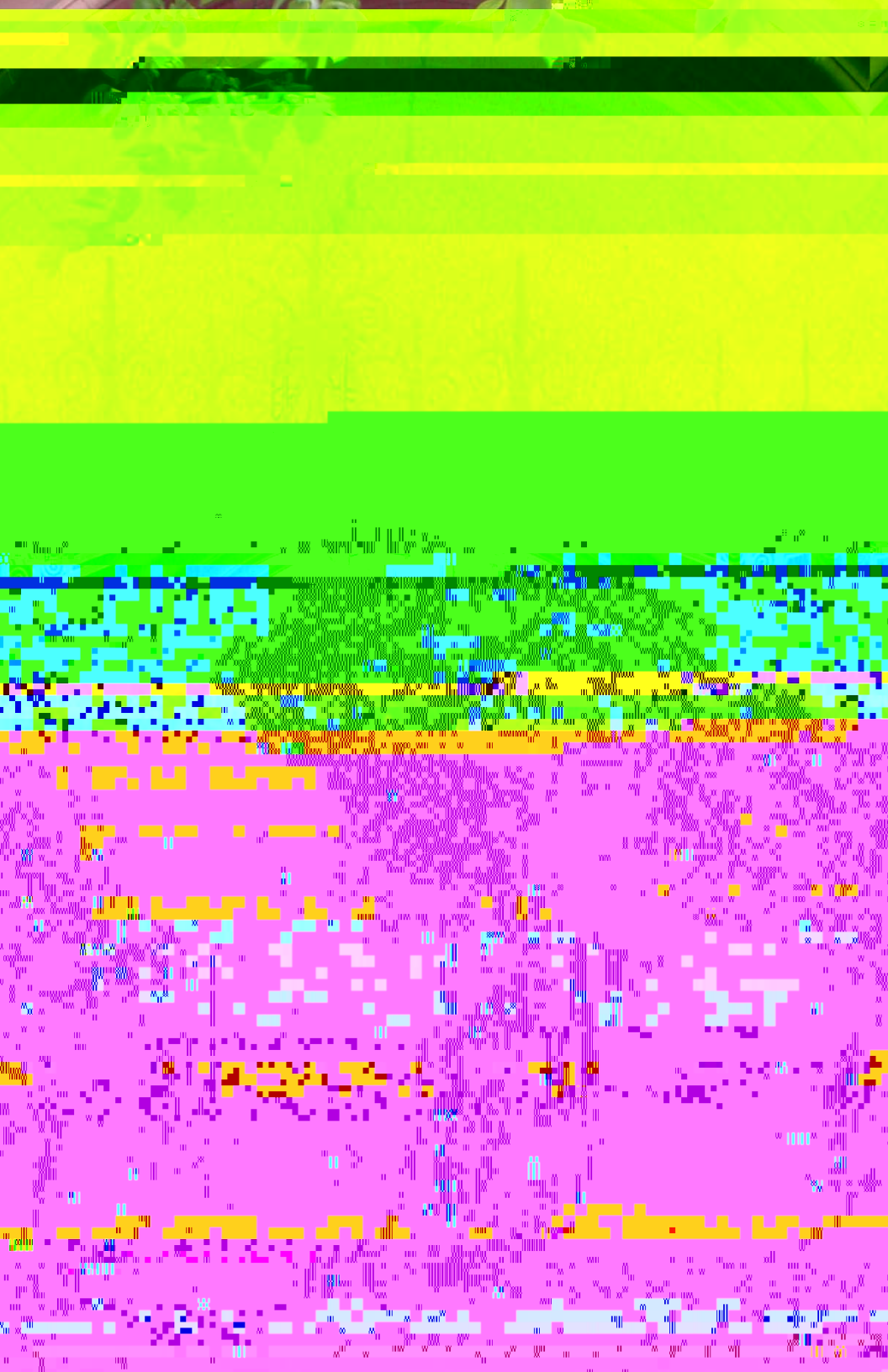


Kge]`af]jnd`okaf`[dhl]`e`]Yk'g'g'l`j`
Y[land`k`o`d``klml]f lk'g'Y[nld&k]d f []`k`Y`
[gd_`ad]f`Yngj&f`_d`]]jko`gjc`f`l`]Ye`k&Qgm`
e`YqZ]`k`q`Zml`qgmf]]\lg`\`e`gf`kljYl]`l`Yl`
qgm[Yf`'af]jYl'o`d``gl`]jk&L`]k`Y[land`k`Yj]`
æ`hg]Yf`lSZml`Yj]`nknYhdj`e`g]`j]`d'p]\`l`Yf`
af]jnd`ok&`n`h]ghd`o`adlhjgZYZd`hJgnal`
^]]\ZY[c`gf`qgmj`hY]d`hYlagf`'af`l`]`n]f lk&
)`&`9ll]f`Yhd`f]jnd`o`Ó]n]f lkS]n]f`
af`qgmYj]`af`qgmj`ge`]`%go`f`&Qgm`
[Yf`hJgnal`nk]`ndaf`'gje`Ylagf`af`qgm`
Yj]`Yq[Yd'klml]f l&Acf go`klml]f lk`
o`g`o`j]`f`gl`Y[[]hl]\`Zq`_jY\`nM]`
k`ggd`kZ]`[Ynk]`l`]q`nk]\`l`]`af]j`%
nd`o`o`]]c]f`lg`e`]]l`o`d``j`af`k`g`j`
^Ye`ad`Yf`\`af`g]`\`hJg`_jYe`Y[land`k&L`]`q`d`^h]ghd`o`d``l`]`æ`hj]k%
kagf`l`Yl`]`q`\`af`O`o`Yf l`lg`[gf f]`[l`o`d``l`gk]`af`l`]`hJg`_jYe`&k]d f []`
d`n]j`q`[gd_`ad&f`_d`]]j`af`_hJgb`[lk`g`l`f`af`ngd]`l]Ye`k`g`^h]ghd`&
A]jnd`o`j]ko`Yf l`lg`cf go`go`qgmio`gm`af]jYl`o`d``[g%`gic]jk&



· * & ·

· , & ·



Chapter Sixteen: Choosing the Right Graduate School for You

A'n]njqf`f`_g]k'o]d[Sqgmio adZ] Y[[hl]\lg'e mdhd`_jYnm] k`ggdYf`
 Z]`M]\`o`d`e`Ycf`_T]\`[[kaf`YZgn`o`d`k`ggdkja`_l`g`j`qgn&Kge]læ]k`
 l`l`[`gaf`ak]YkqDgf]hd[[`bnk]k]e`kdc]T`]Z]k`g`qgn&A`g`l`j]Yk]kqgm
 e`Yq`j]dn]jq]lgf`Z]lo]]f`a`j]f]l`ghlagf`k&L]j]e`YqZ]e`Yf`q`Y[lgk]k]g`f`%
 k&]j`af`e`Ycf`_T]l`[`gaf`&E`gk]g`a`l`læ]Sf`g`k&nMlagf`ak]h]j`l]Yf`q`gm`Yn`
 lg`\[a]o`d`e`Y[lg]k`e`Yll]j`e`gk]lg`qgn&Adc]lg`o]d]\`go`f`hgk&an]kYf`\f`_Y%
 lan]kYf`_an]Y]\`Y[lg]Y`o]a`_l]j]d]\`lg`ak&æ`hg]Yf`[]&Kge]g`a`l`Y[lg]k`
 qgm`e`a`_l`o`Yf]l]lg`f`k&]j`af`[d&]2

.

- ¥H]ghj]lkl`Y`e`Yl`qgnj`af`l]j]kl&3`gg`\S`a`d]j]kh]l]l`e`]f]lg]k
- ¥9ng&`l`ggkaf`_Yk]ggdZ][Ynk]g`gf]`Y[nlq`e`]e`Z]j&9f`q`l`f`_`
 [gn&`Yhh]f`lg`l`Y]gf]e`]f]lg]D`e`gn]kge]o`_]j]qgm`g`f`O`o`Yf`l`
 lg`_gS&k]l`j`q`mf`af`_S]n]f`a`d`k&]\`f`d&
- ¥;`g]`Y[ad&]klg`g`jgm&f]o`gjc`Z`klgq`q`[g]Sk]i`n]f`[f`_`[g]S`
 hjg]f`Y`Yd&k&e`d]jgk]ghq`[YhYZad&]q]je`]f]lg]k]S]l]l&9f`æ`Yd`Y[ad&`
 l&ke`YqZ]æ`hg]Yf]l]lg`qgnj`o`gjc]S]n]f`a`qgn`g`f`O]l`f`c`k`g`f`go`&
- ¥Kl&]f]l`hnZd]Ylagf`k3]Y]j]j]gn]ge]k&`g`l`]q`e`Yl`qgnj`_gYd&7
- ¥`ja]f`a`d]7G`h]f`S]Yk]g`g`[gd]Z]g]Ylagf`7
- ¥O]d]ge]`\an]jklq
- ¥J]hn]Ylagf`g`a`l`_jYnm]k`ggdg]hjg`_jYe`3]Yd&]l`Y]j]hn]Ylagf`k`
 Y]g`l]f`ZYk]\`gf]j]k]Y]l`hg`\n]lanq`g`a`l`Y[nlq`o`d`d&]d]g]f`g`
 af`hn]j]_Y]af`_T]k&n]Ylagf`g`j]k&n]f]lk&

.

Ja`a`g]B]p&Zd]3lqh]k`g`^[]gnjk]k3Z]Yn]`Yf`\`hl`3af`kl&n]lagf`k`Y`l`o`d`
 [gnjk]k[Yf`Z]lYc]f`o`d`gn]hYqf`_lnal&f

.

O`ad&qgm]d&c]T]l`o]Yc]k]k&n]f]f`af`T]hjg`_jYe`7L`Y`e`YqZ]`G`C`S`a`qgm
 Y]`hj]hY]\`lg`\]Ydo`d`T]Z`go`lg`qgnj`_g`Yf`j]Yd&]o`Yf]l]lg`_g`lg`l`k`ggd&
 Kge]g`a`l`k&n]f]lko`g`k]jm`_d`l`T]e`gk]Y];`E`Z][Ye]gn]Z]k]j]k]Y]l`%
]jk&`niSqgmio`Yf]l]lg`_g`lg`Y`_jY`k`ggdo`_l]qgn]Y]k]n]j]gnf`\`Z`q`[`Yd]f`_f`_`
 k&n]f]l]k&L]o`Yq]lg`æ`hjgn]Y`Yf`q]khg]l`ak]g`hjY]l]a]o`d`hd&]q]jko`g`Y]Z]l]j`
 l`Yf`qgm]Y]&



1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

¥



BC

?jY\mM] K[`ggdg^: æge]\d YdK[af[]k
: Yqgj; gd_] 'g^E]\d f']
Gf]: Yqgj HhYs@gmkgf SL] pYk//(+(
'llh2o0o&[e &\nike Y]l'`llh2'00o&[e &\m_jY\k`ggd
)(*((.