From the Editor

10 Ways to Think about Innovation
What successful young technologists know

Each year, we choose the 35 innovators under the age of 35 whose new technologies seem most gloriously creative and most likely to expand human life. (We describe the 2006 winners beginning on page 43.) In editing this year’s TR35—and rereading the profiles of last year’s winners, whom we introduced in the October 2005 issue—I’ve noticed a few things about successful innovation.

(1) Successful innovators are famously untroubled by the prospect of failure. Bryan Cantrill, an engineer at Sun Microsystems who invented software that allows systems engineers to track bugs in real time (and whom we named one of 2005’s TR35), says, “People who have innovated once, and who say they are not frightened that they won’t be able to repeat their success, are probably lying. The challenge is not to be crippled by fear, but allow it to drive you forward.” More profoundly, (2) many innovators appreciate failure. Yael Maguire, the chief technology officer of ThingMagic and another of last year’s TR35, who has designed machines that read radio frequency identification chips, says, “If you’re not working on technologies that are going to fail, you’re not pushing the boundaries enough. Even if a technology failed ... you’ll be able to put it in your back pocket and use it for some other purpose.”
Things you learn on one road can be really helpful on later roads.
Failure teaches valuable lessons

By M.L. Lyke
Seattle Post-Intelligencer

SEATTLE — At 21, he failed in business. At 22, he lost a legislative race. At 26, he fell in love, but his sweetheart died. At 27, he had a nervous breakdown. At 36, he lost a congressional race. At 45, he lost a Senate race. At 47, he failed in a vice presidential bid. At 52, he was elected president of the United States.

His name: Abraham Lincoln.

University of Washington sports psychologist Frank Smoll uses the Lincoln example to teach coaches and athletes about the value of failure.

"Teaching people to lose is an important part of teaching them how to win," says Smoll, who co-directs Husky sports psychology services.

"When you don't get what you want, you have to ask yourself, 'What can I learn from this?'

"The so-called failure might be a gift in disguise."

Lincoln learned a good deal from failure. Great thinkers do. They take risks. They sometimes take falls.

"I think and think for months and years," said Albert Einstein. "Ninety-nine times the conclusion is false. The hundredth time I am right."

But Einstein and Lincoln are American anomalies.

America is a country that wants to win. Bad. All the time.

Psychologists, educators and sociologists characterize our society as one obsessed with victory, with coming in first. Sports are merely a mirror for that obsession.

"Winning, it is true, is the American way — the Holy Grail to which all aspire," wrote Eastern Illinois University professor David Radavich in a humorous U.S. News and World Report essay titled "In life, what's important is that you lose."

Ironically, the cover of the magazine headlined another story: "How to beat the Japanese."

In win-win America, we can't get away from our obsession. It digs in deep and hurts — like after the Seattle SuperSonics' loss to the Chicago Bulls in the National Basketball Association championship.

Smoll says that's part of a phenomenon called BIRG-ing — Basking in Reflected Glory.

"Fans identify with teams," he says. "They feel good if the team does well, they bask in the reflected glory. (But) if the team does poorly, they're going to feel lousy."

So what's wrong with BIRG-ing a little over the glory of second place? America is it. Second best gets no respect. Second-place finishers are second bananas who play second fiddle to first-class athletes.

No. 1 rules, No. 2 drools.

Ask Rosalyn Sumners, a skater hyped to win the gold at the 1984 Winter Olympics. She took the silver.


The No. 2 skater in the world a "loser."

"I felt like a failure for three years for not winning the gold," commented the Redmond, Wash.-based skater, who went on to become a TV commentator and sentimental favorite of the pro-skating tour audiences.

Some athletes take their failure philosophically.

"I learn from it. If you can't learn from losing, from your mistakes, you never learn anything."

But some are terrified by it.

"The way many of them talk about it, it's like dying," says Terry, a visiting professor at the University of Victoria.

That's when winners become losers. Or losers winners.

"When you've been through the experience of losing in a big competition, it makes you a stronger person, more secure in your ability to cope," says Terry. "It actually contributes to the potential of winning."

Near the end of "A Farewell to Arms," Ernest Hemingway put it more succinctly: "The world breaks everyone and many are strong at the broken places."
“Teaching people to lose is an important part of teaching them how to win,” says Smoll, who co-directs Husky sports psychology services. “When you don’t get what you want, you have to ask yourself, ‘What can I learn from this?’

“The so-called failure might be a gift in disguise.”

Lincoln learned a good deal from failure. Great thinkers do. They take risks. They sometimes take falls.

Asked how he handles loss, Dallas Cowboys running back Emmitt Smith said: “I learn from it. If you can’t learn from losing, from your mistakes, you never learn anything.”

Peter Terry, a London-based sports psychologist who worked with athletes at the last three Olympics,

“When you’ve been through the experience of losing in a big competition, it makes you a stronger person, more secure in your ability to cope,” says Terry. “It actually contributes to the potential of winning.”

Near the end of “A Farewell to Arms,” Ernest Hemingway put it more succinctly: “The world breaks everyone and many are strong at the broken places.”
Robert Senkler knows his business from the bottom up, because that's where he started -- as an actuarial trainee 31 years ago.

His career path first emerged in second grade when he realized he was a math whiz. He attended the University of Minnesota, Duluth -- partly because it had a great mathematics department, but also because it was close to some family land where he could hunt.
WHAT HAS WORKED FOR ME
by Robert L. Senkler

- Be a skill collector. Don't wait until you need a skill to develop it, by then it might be too late. Prepare yourself to get lucky.

- Managing expectations is oftentimes as important as the quality of the results.

- Realize that people come to work to succeed, not fail. Everyone has talent and a good leader knows how to find it and free it.

- Don't ask a rabbit to fly. Everyone has limitations and it is much better to use someone's skills than to constantly try to change people.

- Be the best you can be at the job you are given today. Avoid wanting to be somewhere, in some position, at some level. It only uses up energy and creates frustration.

- There are many ways to accomplish something. Define what is acceptable behavior, i.e. behavior that is "on the road." If behavior is "in the ditch", address it aggressively, but leave freedom for people to drive on the road and not necessarily in the exact spot you want them to be driving.

- Have the courage and resolve to always do what is right. Have courage to ask for help. Have courage to try to do your best and risk failing. Have courage to stretch yourself and put yourself at risk.

- Do the best you can – it's all that you can do. If that is not good enough, it does not make you a bad person. If running a ten-flat hundred yard dash was the divider between being a good or bad person, I guess I'm a bad person.

- It is oftentimes your expectations of someone's behavior that creates the problem.

- If you're not having fun, you're not doing it right.
After Senkler graduated from UMD, he
- hired a writing coach
- joined Toastmasters to work on his speaking skills.

Writing and speaking matter.

Read
- Browse the current books
- Reading effective writing helps guide your own writing
- John Grisham or Steven king work fine.

Speak
- Take a speech class
- Act in a play
Career Advice

“Be something you love and understand.”

Ronnie Van Zant
How does a graduate from a small, midwestern liberal arts college end up in charge of hiring scientists and professors for one of the most prestigious medical schools and cancer research institutions in the world? Ask Dr. Tom Roberts ’70, Chairman of the Department of Cancer Biology at the Dana-Farber Cancer Institute and Dean for Graduate Education at Harvard University.

Roberts, who also serves as Professor of Pathology and Chair of the Division of Medical Sciences at Harvard Medical School, says it all goes back to fundamentals.

As a post-doctoral student at Harvard, he was often impressed with how much his colleagues knew—their pure ability to recall obscure facts in just seconds. Surrounded by people who could retain the most minute of details, he often wondered whether he could make it, whether he had what it took to become a research scientist capable of making a difference in science’s war on disease. However, as he began to take exams he found that he had been well-prepared to tackle the problems presented. He knew the fundamentals of problem solving, of analyzing a problem and clearly stating possible solutions.

A lack of enthusiasm, though, is sure to remove you from his potential employment list.

Roberts knows that without enthusiasm, a budding scientist will soon be frustrated that only one in 10, or at best, one in five scientific experiments actually lead to a result which can be published. Interviewees must demonstrate that same insatiable thirst to accept new challenges."
Consulting Advice

John Wilder Tukey, Donner Professor Emeritus of Science at Princeton University and one of the most important contributors to the field of statistics, died 26 July 2000 in New Brunswick, New Jersey, following a heart attack.

The introduction of new terminology to capture distinctive concepts would become a Tukey trademark. For example, he coined the contraction "bit" for binary digit. Tukey is credited with the first printed use of the word "software" to refer to computer programs; he observed that the software might well prove to become more valuable than the hardware.

The saying that "an approximate solution of the exact problem is more useful than the exact solution of an approximate problem" has often been attributed to Tukey.
Understanding the Questions

• For example if your interest is in biological applications
  • Take real biology classes
  • Go to biology and medicine seminars
  • Read published reports
  • Work in a biology lab
    • Computational tasks
    • Web design
    • Volunteer

• Similarly if you have different areas of interest
Data Analysis

Plot the data!
Computing

• Take CS or MIS classes
• Take other classes with computing
  – GIS, Geographic and Information Systems, class
  – Bioinformatics
• Excel, SAS and R
• SAS Certification
  – The Little SAS Book
  – SAS Certification Guide
    • Base Programming
    • Advanced Programming
However

• If you do everything or even everything as well as you can, you aren’t prioritizing.

• “Everything in moderation including moderation” *Lost Horizon*

• Have a few things that you have done thoroughly and well.
  • See recommendations ↓

• Get to know at least three people well enough so that they can give you good letters of recommendation.
  • Recommendations are more than grades.
  • Are you a good team member?
  • Do you have leadership experience?
  • Are you able to solve problems effectively?
    • This may not be in class.
Design and Data Analysis

• Plan carefully before collecting data
  • Avoid bias and unexplained variability
    • Randomization
    • Blinding
    • Placebo, sham surgery
    • Blocking
    • Record covariates and other factors that might influence results
• Understand the questions
• Know how the experiment was conducted
  • Dependence between values
    • Pairing
    • Blocking
    • Fish in tanks, students in schools, …
    • Repeated measures for the same animal, person…
• Check/clean the data
  • Plot individual data points
  • Check for out of bounds entries
    • Age = 240
  • Check consistency of entries
    • Not male and hysterectomy
• Check assumptions
  • Independence: How was the experiment conducted?
  • Plot the original data points
  • Normality
    • PDP polymerase significant after log transformation
    • Insect traps significant after log transformation
  • Equal variances
  • Fixing assumptions
    • Transformations sometimes
    • Other methods
      • Weibull models
• Check assumptions
  • Plot residuals
    • Especially with more complicated data where it’s hard to plot all factors at one time effectively.
  • At least
    • Residuals versus predicted
    • Normal plot of residuals
    • Cook’s Distance
  • Additionally helpful to plot residuals
    • vs factors in the model
    • vs other variables such as technician
    • In time order of collection
      • Check for drift over time
• **Cook’s Distance**: See answers to Lab 6
  • An extreme outlier may not have a large residual
    • If it has large influence on the fitted model.
• **Cook’s Distance**: See answers to Lab 6

• Ross Garberich's master's project
  • "The Economic Utilization of Patients with Refractory Angina"
• Here one patient had a very large influence on the results.
• The patient had 30 lifetime angioplasties.
• When the angioplasties were grouped into 5 or more angioplasties, the Cook’s distance plot is just fine.
• Cook’s distance > 0.5 is often considered big
• Cook’s distance > 1 is often considered a definite problem
• Include factors in models that improve predictions
  • Include temperatures when comparing brands of syrups
  • Include covariate Use when comparing keyboard pain
  • Include blocks=sites when comparing insect traps

• Don’t overfit
  • Hypothesis tests
  • Information Criteria: Akaike Information Criterion (AIC)
    • AICC : Corrected for small sample sizes

• The fourth order polynomial in pink
  • Fits the data exactly: Error SS=0,
  • But likely would not work well for predicting for x=0.5 or x=1.5
Using Regression Class Formulas

Using \( x = 1, 2, 3, 4, 5 \)

At \( x = 6 \) \( \text{SE}(\hat{y}) \) Simulations (1000)

<table>
<thead>
<tr>
<th>Function</th>
<th>SE</th>
<th>Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Quadratic</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Cubic</td>
<td>4.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Quartic</td>
<td>15.8</td>
<td>15.6</td>
</tr>
</tbody>
</table>
The formulas are simplest for orthogonal polynomials

- Inverting a diagonal matrix, $X^T X$, is simple.

$$P_1(x) = x - \bar{x}$$

$$P_2(x) = (x - \bar{x})^2 - \frac{a^2 - 1}{12}$$

$$P_3(x) = (x - \bar{x})^3 - (x - \bar{x})\frac{3*a^2 - 7}{20}$$

$$P_4(x) = (x - \bar{x})^4 - (x - \bar{x})^2\frac{3*a^2 - 13}{14} + \frac{3*(a^2 - 1)(a^2 - 0)}{560}$$

$$\hat{y} = \bar{y} + \hat{\beta}_1 * P_1(x) + \hat{\beta}_2 * P_2(x) + \hat{\beta}_3 * P_3(x) + \hat{\beta}_4 * P_4(x)$$

Using these orthogonal polynomials

- Type I and Type III SS are the same
- SS for $P_2(x)$ is SS explained by a quadratic term above and beyond the linear term
%let b0=5;
%let b1=2.0;
%let std=1;
%let nsim=1000;

data polynomial;
   call streaminit(0);
   do isim=1 to &nsim;
      do time= 1 to 5 by 1;
         mu=&b0+&b1*time;
         y=rand('normal', mu, &std);
         output;
      end;
      time = 6;  y = .; output;
   end;
run;
ods listing close;
proc glm data=polynomial;
  model y = time;
  output out=outp p=pred;
  by isim;
run;
ods listing;
proc means data=outp;
  where time = 6;
  var pred;
run;
For Balanced Factorial Models and/or Blocks

• The complexity of the comparison of treatment effects is the same whether we include another factor or blocks.
  • The difference between means with same number of values in the means either way.

• The only down side is fewer df for estimating the variance.
• Pay attention to interactions
  • Main effects need to be interpreted very carefully when there are interactions.
  • In the KCT example K does not have a significant, but K definitely affects yield.
    • But differently for low and high temperatures
    • Don’t summarize K effects with means over both temperatures
    • Summarize K effects separately for low and high temperatures
  • In the age at metamorphosis data on Assign 7
    • B and C do not have significant main effects
    • But based on significant interactions, both B and C do affect age at metamorphosis.
Account for Unbalanced Data

- Use **Least Squares Means** and **Type III SS** when appropriate.
  - Sometimes we are still interested in Type I SS or unadjusted comparisons.
  - For The Rose-Hellekant PCR data, we could still be interested in tamoxifen vs placebo not adjusted for outcome, since the outcome is also partially a result of the treatment.
  - If we have correlated effects, possibly neither is significant with Type III SS while one or both could be significant for Type I SS
  - There are also sound arguments for using Type II SS which we didn’t cover.

- Adjust effects of keyboard on pain according to how much the keyboards were used.
- Adjust comparisons of male and female mice to account for different mixes of young and old mice.
- Adjust comparisons of tomato varieties to account for one variety not being used in all of the blocks.
Account for Random Effects

- **Don’t pretend** that measurements for each fish in a tank are separate independent pieces of information, independent replicates.
- **Don’t pretend** testing the same paper helicopter more than one represents a separate independent piece of information.
  - This is pseudo-replication mistake (Hurlbert, 1984)
- If data are balanced, the analysis could be done with means in each tank of fish.
  - But don’t do this if data are unbalanced.
  - Also, estimating sizes of variances from different sources can be used to decide how to use resources optimally in the next experiment.
    - At what point is it better to take the time to make the next paper helicopter rather than flying this helicopter again?
    - See notes on random effects and nesting.
- **Don’t end up** saying that a medication has an effect in the wider population of possible patients based on data from just two patients.
Think about and check whether the results make sense

• Plot the data!
• In one case a student was getting p-values of less than 1 in a million in their master’s project when the right p-values were more like 0.6
  • Plotting the data is the best protection to check the p-values.
• Don’t decide that Hansen and Eggo syrups are not different when the plot clearly shows that they are different.
• Check results with alternative calculations
  • Check that df in an ANOVA table add to the right value.
  • Simulations
  • When using a new program, run the program on a set of data where you know the right answer to check that you are using the program correctly.
    • Use unbalanced data to make the test more general.
• Check that results make sense based on knowledge of the system.
  • Check if the estimate of slope for pain versus amount of use of a keyboard comes out negative.
Oscar L. Miller, Jr., Presents Commencement Address Receives Outstanding Achievement Award

Oscar L. Miller, Jr., a 1960 Ph.D. recipient in plant genetics from the University of Minnesota, was presented with the University's highest award to an alumnus, the Outstanding Achievement Award, on Friday, May 13, during the Graduate School commencement ceremony. This award is conferred upon alumni and former students of the University who have gained distinction in their chosen professional or public service fields and have demonstrated achievement and leadership on a community, state, national, or international level.

Dr. Miller, who is currently Lewis and Clark Professor of Biology at the University of Virginia, has conducted extensive research in the ultrastructural analysis of genetic material. His laboratory specializes in electron microscope chromosome-spread techniques (often called "Miller spreads") that allow for the viewing of gene expression, yielding insights into the molecular control mechanisms of DNA replication and RNA and protein synthesis.

Committed to the training of future scientists, Dr. Miller involves undergraduate and graduate students, as well as postdoctoral associates, in his research group. During his career, Dr. Miller has served as visiting investigator at five institutions and has presented nearly 200 invited lectures, more than a quarter of which were overseas. Dr. Miller was elected to the National Academy of Sciences in 1978 and has been a Senior Fulbright Scholar at the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia.

Professor Miller's Graduate School commencement address printed below outlines his vision for success, at both the personal and professional levels.

Commencement Address: MEMORY TRACES

Opening Remarks

Norfolk: The force of his own merit makes his way.
A gift that heaven gives him, which buys
A place next to the King.

Henry VIII 1.1.54

You are now in a place next to the King. At this moment in time, each of you is a member of an elite congregation that spreads throughout our world. You are among the most intelligent of your species. You are well educated. You are envied. You are the best, and you stand poised on an exciting new threshold of your life. Because you are, at this time, the best of our species, the rest of Homo sapiens must challenge you as to how you will use your gifts, because they belong to us as well as to you, even to those of us yet unborn.

How did you manage to get a seat next to the King? By hard work on your part? A resounding, "Yes!" By hard work on your part only? A thunderous, "No!" You are present in a seat next to the King because of "memory traces." The entire fabric of your conscious and unconscious selves has been woven by thousands of memory traces left by others that have interacted with your mind during your lifetime. The weaving continues today, and will until your brain ceases to function. You were loved. You were taught self-discipline. Someone gave your curiosity free rein. Someone gave you an alphabet. Someone gave you books. Someone gave you inspiration. There was encouragement in rough spots. A little extra money or other resources at crucial decision times. Myriad and myriads of such actions by others during your years, most forgotten now, enabled you to do the things that put you here in your seat by the King.

But do not sit so easily in your place next to the King, for you are a debtor. You are in debt to those memory traces loaned to you by people living in times before you were born and during your lifetime. You owe, and the bill is begin-
Graduate School News

Cultivate Awareness and Flexibility

Coward: Where it is impossible you should take root but by the
fair weather, that you make yourself. It is needful that you
frame the season for your own harvest.

Much Ado About Nothing 1.3.24

Continually cultivate an awareness of where you stand in the
scheme of things in your vocation. Even if you have a se-
cure, solid position, it behooves you to remain aware of
potential options in your chosen and related fields.

A friend in the past was a general manager of a large au-
motive concern - sales, service, the works. Had been for
years - secure, admired. Yet, he kept applying for equal or
better positions to see if his credentials were remaining high.
He was usually successful with these attempts, and there
was always the possibility that he and his family might de-
cide to move to one of these new situations. Know your
value. Do not paint yourself into a vocational corner by keep-
ing blinders on. To be certain of paying off your debt of
memory traces, you must keep increasing your market value
and maintain maximum flexibility.

Be Resolute

Bastard: Be stirring as the time; be fire with fire;
Threaten the threatner, and outface the brow
Of bragging honor; so shall inferior eyes,
That borrow their behavours from the great,
Grow great by your example and put on
The dauntless spirit of resolution.

King John 5.1.48

You will not remain a student, and you will not reach any of
your grand goals unless you develop an urgent sense of reso-
lution. On a laboratory wall at the University of Virginia
there is a sign that reads “To See Genes in Action, One Must
Have Patience, Persistence, and a Lot of Luck.” The
serendipity of luck may possibly be yours, but you will not
be able to count with certainty on that type of windfall to
help pay your debts. You must also swear a silent oath to
yourself that you will force yourself to have the patience,
and, if needed, the persistence, and, if necessary, the per-
severance to bring your goals to fruition. To repay your debts,
you must be ready, day by day, with dauntless resolution!

Cultivate Consideration, Concern, and Compassion

Hermione: One good deed dying tongueless
Slaughters a thousand waiting upon that.

The Winter’s Tale 1.2.92

You must cultivate consideration and respect for your fellow
Homo sapiens within three time frames.

The mother of my father researched and wrote a small book
titled “Sketch of Miller and Calhoun-Miller Families,”
which was published in 1927, two years after my birth.
Graduate School News

ring to come due. The only legal tender will be the memory traces you produce. Bad memory traces will not be acceptable, and the payment time is very short, only the rest of your life.

How can you create memory traces of the necessary value to repay your loans when they are called?

Be a Student All Your Life

Berosus: What is the end of study, let me know?
King: Why, that to know which else we should not know.
Berosus: Things hid and hark! (you mean) from common sense?
King: Ah, there's study's god-like recompense.
Love's Labor Lost 1.1.55

First, be a student always. To repay your debt, you will need "study's god-like recompense." It is self-evident that you must continue to study to excel in your vocation. But you must also study to broaden other horizons of knowledge, to prevent you from becoming narrow-minded and insular with the passage of time.

You are an astrophysicist, study the inner spaces of life. You are a molecular biologist, study the frontiers of space. You are a historian, study organic evolution. You are a studio artist, study the artistry in engineering. If you pursue such things as these, you will receive recompense, the enrichment of your life and the lives of those you touch, and you will produce memory traces of high value.

Set Lifetime Goals

Deidamia: Men's natures wrangle with inferior things
Though great ones are their object.

Othello 3.4.131

You have attained a great goal, your graduate degree. To come near to receiving the godlike recompense that will enable you to become a person free of debt to your memory traces, you must consciously set up goals beginning now. Set precise, short-term and long-term goals. Always have an agenda, a tentative outline of your life. You must have time for your vocation, but it is imperative that you allot time for your enrichment endeavors. After reflecting on what should be the great, grand goals of your life, put expected achievement dates on your calendar. Put self-interview dates on your calendar, perhaps every three months or so to assess your progress. Do longer, in-depth interviews, say one a year. Why not on your birthday? Think about forming an outside review panel of two or three good friends (include your spouse, if married). Familiarize them with your goals, give them a progress report, and request constructive criticism and recommendations for future steps.

Remember, always set your goals with great ends as their objects, the greatest ends being memory traces of legal tender.

Cultivate Awareness and Flexibility

Cordax: Where it is impossible you should take the root but by the fair weather that you make yourself. It is needful that you frame the season for your own harvest.
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Basted: Be stirring as the time; be fire with fire;
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There is the following quotation on the front page dedicating the volume to her deceased husband and their children: "A people who forget the noble deeds of their remote ancestors will achieve nothing worthy to be remembered with pride by remote descendants."

Study and reflect on the worthy deeds of your species, especially the deeds, great and small, that gave rise to your memory traces. Have thankful respect for the first time frame, history. The second time frame is today. You must have consideration and respect for those that live with you on this planet now and also quest for the knowledge that will allow our species to survive and thrive. Be wise in your advice. Be compassionate. Do not slaughter a thousand good deeds of others by remaining tongueless. Be free with your praise and respect. Your third time frame involves the yet-to-be-born members of our species. Respect them enough to leave your little niche of the world more beautiful with an intellectual and moral environment that will give them the flexibility of choices that will allow them to do the same for those generations following them. These humane traits will put memory traces of worth in your bank account.

Smell the Flowers and Dream

Thoughts are but dreams until their effect be tried

The Voyage of Ulysses

Even if you think you do not have time, grasp the time necessary to try the effects of your dreams. Do not wait until the twilight of your life, for then you surely will not have time enough. Take time to compose a poem of your own, to study the twinkling starry constellations. Take time to compose a tune, a sonata if you may, to try a watercolor or an oil. No matter that all such uplifting endeavors have been done before by many others, and better, much better perhaps, than you ever will do. These will be your creations, and thereby, become precious to you, even as his rose is to the Little Prince.

Your life will be greatly enriched by your trying, and you will gain a special inner composite that will spread into all aspects of your life, giving rise to a rich diversity of memory traces flowing from you.

Be Intellectually Honorable

Polonius: This above all:
   To thine own self be true,
   And it must follow as the night the day
   Thou canst not then be false to any man.

Hamlet 1.3.78

Your most important attribute will be intellectual honesty, and it must, at all cost, be rigorous. You must use this trait continuously in all aspects of your life. You cannot for one moment allow chinks to develop in this moral, intellectual armor. If blemishes appear, there will be no sudden penetration of dagger or sword. There will be a sad, gradual erosion of your good character that will permeate all aspects of your life. Your vocational work will be suspect. Your poem will not inspire. Your sonata will be off key. Your oil painting will run. Your watercolor will fade. And pages will be torn from your book. The tragedy, however, will be that you will not be trusted, you will not have real respect, and no one will truly love you. You will be unable to leave worthy memory traces if you are intellectually dishonest, and you will remain forever a debtor scorned.

Closing Remarks

Brutus: There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in shallows and in miseries.
On such a full sea are we now afloat;
And we must take the current when it serves,
Or lose our ventures.

Julius Caesar 4.3.317

So now, you will leave your place by the King to receive your well-deserved sheepskin from your honorable Dean. Then you will go and have your beer and pizza, or whatever, with your family and friends. Your individual challenges will remain in abeyance for a little while. But after your festivities are over, they will appear to you and say to you, "Here we are! Do with us what you will, but you must do something with us, or we will quickly pass you by and go onward to another place and time." If this happens, then memory traces of legal tender will never exist for you. But, if you grasp your challenges boldly and meet them with dauntless resolution, then you will enter the twilight of your life with your debt of memory traces paid in full, yea, even overpaid.

In closing, the fervent wish for each of you is that after you finally enter the twilight of your life, when the main ventures of your life are ending, you can gaze backward across the years and say, I wish, I wish I could do it all over again. Not because you think your record was bad, but just because you would like to have a second chance to do it a little better.

Bon voyage!
Cultivate Consideration, Concern, and Compassion
“A little love and affection in everything you
Will make the world a better place with or without you.”
Neil Young *Greendale*

Stop to Smell the Flowers and Dream
“You’ve got to have a dream.
If you don’t have a dream,
How you going to have a dream come true?”
*South Pacific*