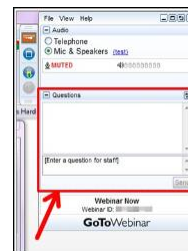




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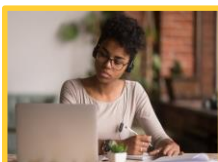
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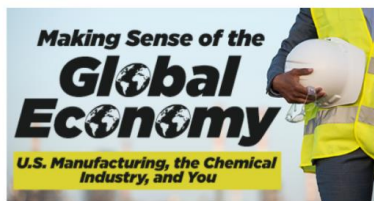
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# FORMAL SYNTHESIS OF A PROFESSIONAL CHEMIST



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## Formal Synthesis of a Professional Chemist



**Matt Grandbois**  
 Strategic Partnership Manager,  
 DuPont Electronics & Industrial



**Annabelle Lolinco**  
 Chemistry Graduate Student, Iowa State University and Diversity,  
 Equity, and Inclusion Co-Chair, National Science Policy Network

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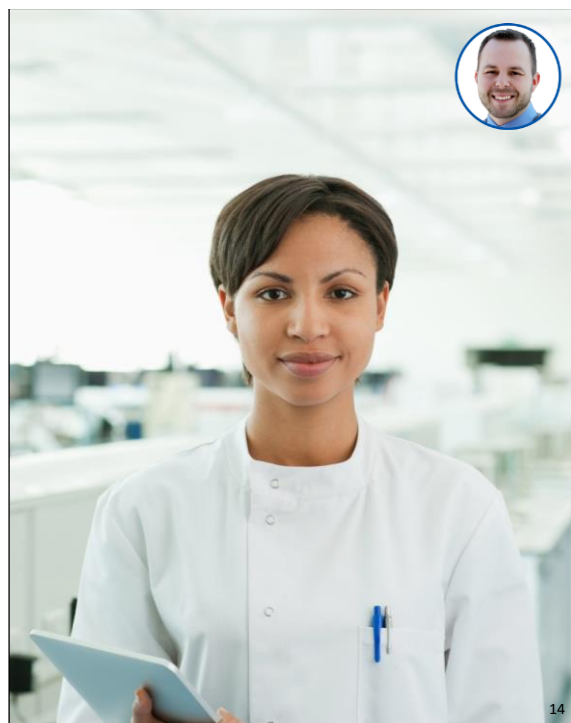
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## A Professional Chemist

- Professional chemists (noun) – *engaged scientists trained on and qualified in the practice of chemistry.*
- Found in a variety of occupations ranging from academia, industry, government, and non-traditional.
- Key features and characteristics:
  - Highly adept at applying chemical knowledge to benefit existence
  - Recognizes the utility of both technical data and critical 'soft skills'
  - Chiral entities with numerous contiguous heterogeneities



14

## Careers Built On Professional Complexity



- Careers are built by synthesizing a final advanced product from its constituent parts and experiences
- Much like complex total syntheses, there are numerous ways to access your goal whether

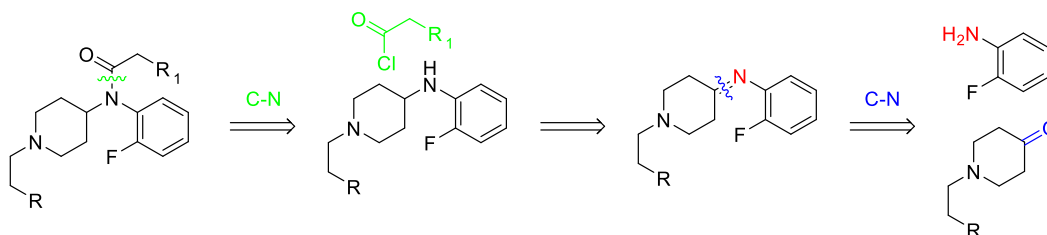
**Breaking a career down into smaller pieces makes it more manageable with clearer goals and milestones.**

15

## Retrosynthesis: Breaking down a Career



- **Retrosynthesis** is a technique utilized by synthetic chemists to develop a strategy for overcoming chemical problems



- Retrosynthetic analysis requires you to sequentially transform your target into simpler precursors that can be combined using well established methods and techniques
- This process continues until an available starting material is identified

16



## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



### Which E.J. Corey publication formalized the concept of retrosynthesis?

- Enantioselective Chemical Synthesis: Methods, Logic, and Practice
- One Bond, Two Bond, Red Bond, Blue Bond
- The Logic of Chemical Synthesis
- The Chemist: There and Back Again



17



## Identification of KSA's



- Successful chemists use **Knowledge, Strengths, and Abilities** (KSA's) to differentiate themselves and achieve their goals
- KSA's are reaction products from experiences earlier in their developmental phases
- Much like *organic functional groups*, KSA's can often be identified by outsider observers
- Identifying KSA's in others and their formative experiences can aid you in developing your own professional development journey

18

## KSA's Derive from Prior Experiences



### Strong Presentation Skills

- Previous jobs that required significant public speaking
- Numerous speaking engagements at ACS Conferences
- Active membership within speech club or theatre organization



### Strong Interpersonal Skills

- Previous jobs that required coalition building
- ACS Leadership Development Series training on communication strategies
- Involved in recruiting programs for work or other organizations



19

## KSA's of Successful Professional Chemists

Communication Skills	Creativity
Teamwork/Collaboration	Decision Making
Adaptability/Flexibility	Networking
Problem Solving	Leadership
Critical Observation	Self-Confidence
Conflict Resolution	Acceptance of Criticism
Time Management	Positive Attitude
Work Ethic	Growth Mindset
Patience	Resilience
Influence/Persuasion	Coaching/Coachability



20

## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which compound was the first natural product ever synthesized from inorganic starting material?

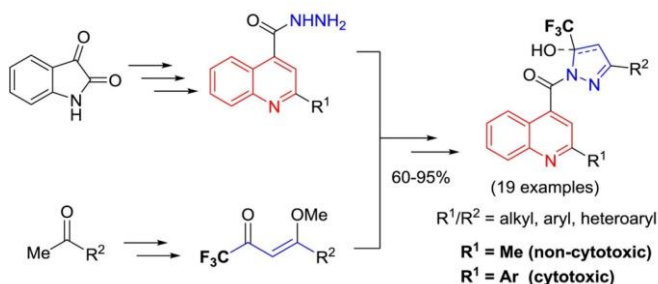
- Caffeine
- Sucralose
- Urea
- Butyl Lithium



Urea was synthesized from inorganic starting materials by Friedrich Wohler in 1828 by treating silver cyanate with ammonium chloride.

21

## Convergent Approach to Career Planning



- Convergent synthetic strategies are used to maximize final yields by combining key elements at a **later stage** of the synthesis
- With a desired target in mind, identify the KSA's you will need to be successful in that future role and their formative experiences

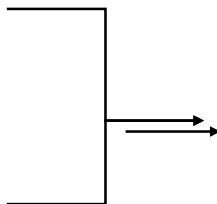
## Convergent Approach to Career Planning



Develops Strong  
Presentation Skills



Develops Strong  
Interpersonal Skills

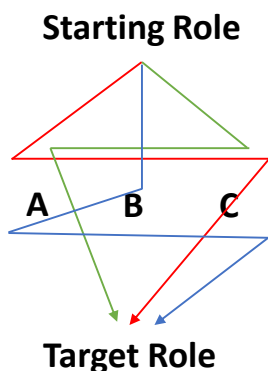


Personalized  
combination to  
maximize success

- Combining KSAs developed from previous positions allow you to create a unique experience geared toward helping you achieve success
- Layer experiences to include on the job roles, extracurricular activities, specialized education, and individual passions

23

## Convergent Strategies Enable Flexible Timing

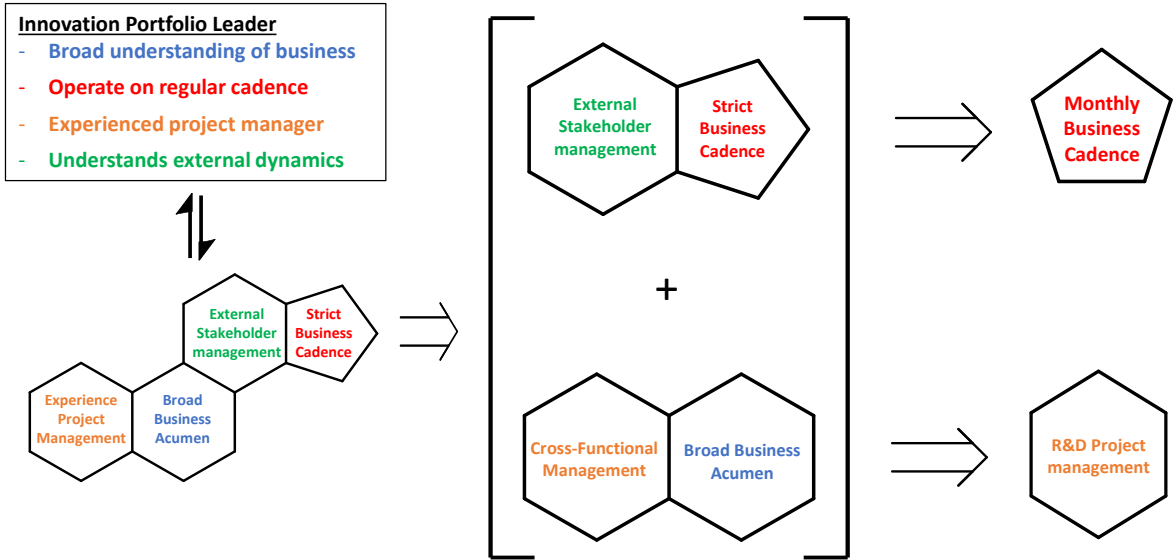


- You may identify more than one KSA needed for a target role is identified
- If this occurs:
  - Establish a **preferred path**
  - Analyze alternative pathways (**#1 & #2**)
  - Recognize progress occurs in many ways
- Conducting a thorough retrosynthetic analysis will help you identify multiple career pathways to help you in the chance you find yourself in a dead end

Path	Role 1	Role 2	Role 3
<b>Preferred Path</b>	A	B	C
<b>Alternate Path #1</b>	B	A	C
<b>Alternate Path #2</b>	C	B	A

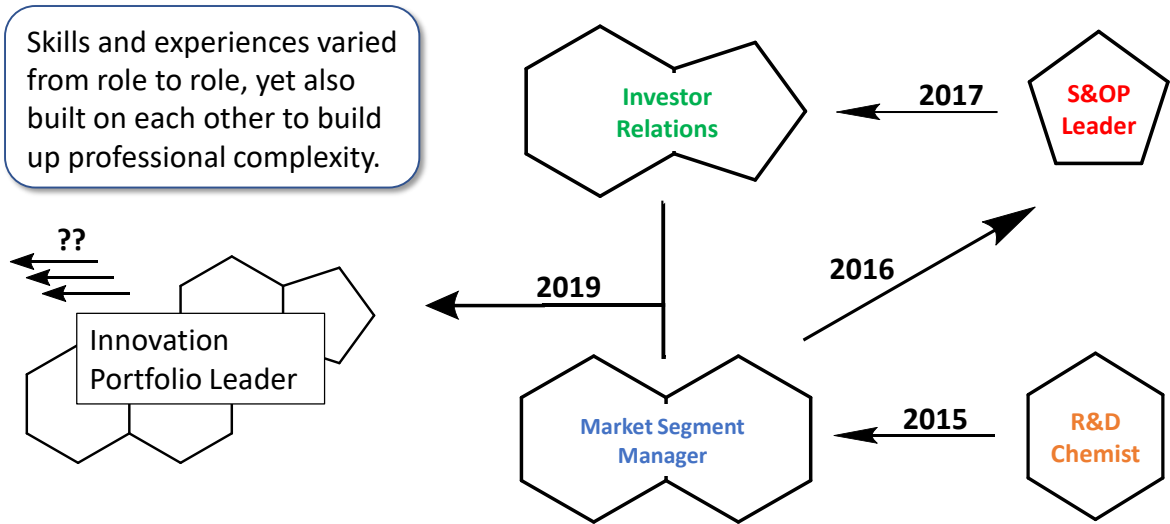
24

# Retrosynthetic Example: Innovation Portfolio Leader



25

# Formal Convergent Synthesis of an Innovation Portfolio Leader

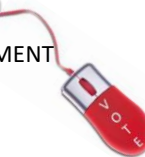


26



## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which of the following is NOT a commonly used synthetic strategy?

- Convergent
- Divergent
- Allegiant

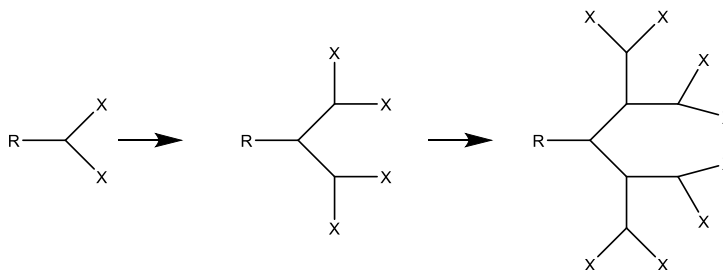


27

## Divergent Development Strategies



- Divergent strategies quickly build up complexity through a selective and disciplined approach of increasing potential at every step
- Within a flask, divergent synthesis are a common approach to prepare highly ordered, branched polymeric materials called **dendrimers**



28

## Divergent Professional Development



- Divergence helps when you don't know exactly where you're going
- Leverage your strengths to find new opportunities that build on each other
- Development occurs when potential meets experience at just the right time



## Convergent vs. Divergent Strategies

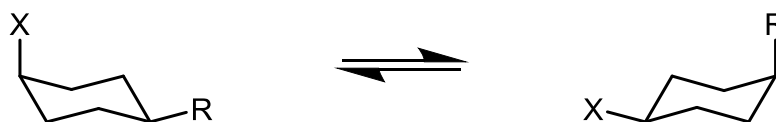


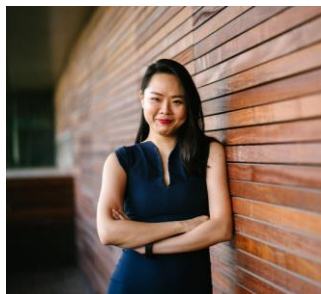
### Convergent

- Clear end goal in mind
- May not know your strengths
- Requires planning and strategizing
- Flexible timing for next step

### Divergent

- Don't know what you want to be yet
- Good understanding of current strengths
- Requires initiative and patience
- Discovery based learning!





## Shifting Strategies



- Choosing a development strategy today doesn't limit your options for the future
- Having the agility to switch between the two may help you achieve your goals:
  - Early in your career, a divergent strategy may help you get out of "analysis paralysis"
  - Late in your career, a divergent strategy may help you achieve progress and find interesting ways to growth
  - Early in your career, a convergent strategy provides focus
  - Late in your career, a convergent strategy brings all the pieces together to coalesce around a unique purpose

31

## Formal Synthesis of a Professional Chemist

- The objective of a Total Synthesis is to achieve your target molecule in the most elegant, innovative, and efficient manner
- In Formal Synthesis, the target is an advanced, complex intermediate that can take advantage of learnings from others to achieve your goal
- Each of our career development journeys is as unique as the countless synthetic pathways that fill the annals of organic chemistry
- Whether you have the final target in mind or not, establishing a career development plan that engages and inspires you is the key for success

32



## Next Steps & Resources



### Next Steps:

- Identify your KSA's as building points
- Conduct retrosynthesis of mentor/goal
- Develop career development plan

### Resources:

- "[What I learned](#)" – ACS Industry Matters
- [ACS Leadership Development System](#)
- [ACS Division of Professional Relations](#)
- [ChemIDP](#)


33

## Conclusions



- Retrosynthetic analysis techniques can help us develop professional development strategies to help us achieve our career goals
- Divergent and convergent strategies are ways for us to build on existing strengths in order to develop new and complementary ones
- Regardless of where you are in your career journey, the application of professional development strategies can help you achieve success



34



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**Matt Grandbois**  
Strategic Partnership Manager,  
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**Annabelle Lolinco**  
Chemistry Graduate Student, Iowa State University and Diversity,  
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## Final Thoughts

- Professional Development occurs whether you intentionally do it or not, so enjoy it!
- There are a million ways to achieve your career goals; just keep focused on the horizon.
- Some pathways result in dead ends, but they are not the end of your path...it's the start of a new chapter!





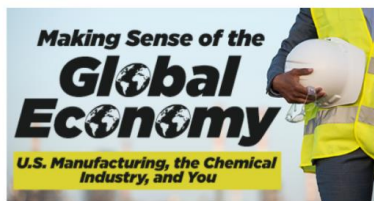
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