

# Science

Nguyễn Quân Bá Hồng<sup>1</sup>

May 11, 2022

<sup>1</sup>Independent Researcher, Ben Tre City, Vietnam  
e-mail: [nguyenquanbahong@gmail.com](mailto:nguyenquanbahong@gmail.com)

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# Chapter 1

## Feibelman, 2011. *A PhD Is Not Enough!: A Guide to Survival in Science*

### Amazon/A PhD Is Not Enough!: A Guide to Survival in Science by Peter J. Feibelman

“Everything you ever need to know about making it as a scientist<sup>1</sup>.

Despite your graduate<sup>2</sup> education<sup>3</sup>, brainpower<sup>4</sup>, & technical<sup>5</sup> prowess<sup>6</sup>, your career<sup>7</sup> in scientific<sup>8</sup> research<sup>9</sup> is far from

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<sup>1</sup>**scientist** [n] a person who studies 1 or more of the natural sciences

<sup>2</sup>**graduate** [n] **1.** a person who has successfully completed a course of study, especially a person who has a 1st university degree; **2.** (*North American English*) a person who has completed their high school studies; [v] **1.** [intransitive, transitive] to get a degree, especially your 1st degree, from a university or college; **2.** [intransitive, transitive] (*North American English*) to complete a course in education, especially at high school; **3.** [intransitive] **graduate (from something) to something** to start doing something more difficult or important than what you were doing before.

<sup>3</sup>**education** [n] **1.** [uncountable, singular] a process of teaching, training & learning, especially in schools or colleges, to improve knowledge & develop skills; **2.** [uncountable] a particular kind of teaching or training; **3.** (**Education**) [uncountable] the institutions or people involved in teaching & training; **4.** (usually **Education**) [uncountable] the subject of study that deals with how to teach.

<sup>4</sup>**brainpower** [n] [uncountable] the ability to think; intelligence.

<sup>5</sup>**technical** [a] **1.** [usually before noun] connected with the use of science or technology; involving the use of machines; **2.** [usually before noun] connected with a particular type of activity, or the skills & processes needed for it; **3.** [usually before noun] (of language, writing or ideas) requiring knowledge & understanding of a particular subject; **4.** connected with the details of a law or set of rules.

<sup>6</sup>**prowess** [n] [uncountable] (*formal*) great skill at doing something.

<sup>7</sup>**career** [n] **1.** the period of time that you spend in your life working or doing a particular thing; **2.** the series of jobs that a person has in a particular area of work, usually involving more responsibility as time passes.

<sup>8</sup>**scientific** [a] [usually before noun] **1.** involving science; connected with science; **2.** done in a careful & organized way, SYNONYM: **methodical**.

<sup>9</sup>**research** [n] [uncountable] careful study of a subject, especially in order to discover new facts or information about it. The plural form **researches** is also sometimes used in British English, but is much less frequent.; [v] **1.** [transitive, intransitive] to study something carefully & try to discover new facts about it; **2.** [transitive] to collect information for an article, a book, etc.

assured<sup>10</sup>. Permanent<sup>11</sup> positions<sup>12</sup> are scarce<sup>13</sup>, science<sup>14</sup> survival<sup>15</sup> is rarely<sup>16</sup> part of formal<sup>17</sup> graduate training<sup>18</sup>, & a good mentor<sup>19</sup> is hard to find.

In *A Ph.D. Is Not Enough!*, physicist<sup>20</sup> PETER J. FEIBELMAN lays out<sup>21 22</sup> a rational<sup>23</sup> path<sup>24</sup> to a fulfilling<sup>25</sup> long-term<sup>26</sup> research career. He offers sound<sup>27</sup> advice<sup>28</sup> on selecting<sup>29</sup> a thesis<sup>30</sup> or postdoctoral<sup>31</sup> adviser<sup>32</sup>; choosing among research

<sup>10</sup>**assured** [a] **1.** certain to happen; **2. assured of something** (of a person) certain to get something; **3.** showing confidence in yourself & your abilities.

<sup>11</sup>**permanent** [a] lasting for a long time or for all time in the future; existing all the time, OPPOSITE: **temporary**.

<sup>12</sup>**position** [n] **1.** [countable] the place where somebody/something is located; **2.** [uncountable] the place where somebody/something is meant to be; the correct place; **3.** [countable, uncountable] (**in/into a**) **position** the way in which somebody is sitting or standing; the way in which something is arranged; **4.** [countable, usually singular] the situation that somebody is in, especially when it affects what they can & cannot do, SYNONYM: **situation**; **5.** [countable] an opinion on or attitude towards a particular subject; **6.** [countable, uncountable] **position (of somebody/something)** the level of importance of a person, organization or thing when compared with others, SYNONYM: **status**; **7.** [countable] a job, SYNONYM: **post**; **8.** [countable] a place in a race, competition or test, when compared with others; [v] **1.** to put somebody/something in a particular position; **2.** [often passive] to put somebody/something in a particular situation, especially when it affects what they can & cannot do; **3.** to advertise a product, service or business as satisfying the needs of a particular group of customers.

<sup>13</sup>**scarce** [a] (**scarcer, scarcest**) if something is scarce, there is not enough of it & it is only available in small quantities.

<sup>14</sup>**science** [n] **1.** [uncountable] knowledge about the structure & behavior of the natural & physical world, based on facts that you can prove, e.g. by experiments; **2.** [uncountable] the study of science; **3.** [countable, uncountable] a particular branch of science, especially biology, chemistry or physics; **4.** [singular] **science of something** a system for organizing the knowledge about a particular subject; **not an exact science** [idiom] used to describe an activity that is based partly on guessing & opinions, not only on accurate measurements & set rules.

<sup>15</sup>**survival** [n] **1.** [uncountable] the state of continuing to live or exist, often despite difficulty or danger; **2.** [countable] **survival (of something)** something that has continued to exist from an earlier time, SYNONYM: **relic**; **the survival of the fittest** [idiom] the idea that only the people or things that are best adapted to their surroundings will continue to exist.

<sup>16</sup>**rarely** [adv] not often.

<sup>17</sup>**formal** [a] **1.** following strict rules of how to do something; suitable for an official occasion, OPPOSITE: **informal**; **2.** (of speech or writing) suitable for official or series situations, OPPOSITE: **informal**; **3.** (of education or training) received in a school, college or university rather than gained just through practical experience, OPPOSITE: **informal**; **4.** concerned with the form of the structure of something rather than its content; **5.** concerned only with following rules.

<sup>18</sup>**training** [n] [uncountable] the process of learning the skills that you need to do a job.

<sup>19</sup>**mentor** [n] **1.** an experienced person who advises & helps somebody with less experience over a period of time; **2.** an experienced person in a company, university, etc. who trains & advises new employees or students.

<sup>20</sup>**physicist** [n] a scientist who studies physics.

<sup>21</sup>**lay out** [phrasal verb] **lay somebody ↔ out** **1.** to knock someone unconscious; **2.** to prepare a dead body to be buried; **lay something ↔ out** **1.** to spread something out so that it can be seen easily or is ready to use; **2.** [often passive] to plan how something should look & arrange it in this way; **3.** to present a plan, an argument, etc. clearly & carefully, SYNONYM: **set something ↔ out**; **4.** (*informal*) to spend money, SYNONYM: **fork out (for something)**.

<sup>22</sup>**layout** [n] [usually singular] the way in which the parts of something such as the page of a book, a garden, or a building are arranged.

<sup>23</sup>**rational** [a] **1.** (of behavior or ideas) based on reason rather than emotions, OPPOSITE: **irrational**; **2.** (of a person) able to think clearly & make decisions based on reasons rather than emotions, SYNONYM: **reasonable**; OPPOSITE: **irrational**.

<sup>24</sup>**path** [n] (plural **paths**) **1.** a way or track that is built or is made by the action of people walking; **2.** [usually singular] a line along which somebody/something moves; the space in front of somebody/something as they move; **3.** (also **pathway**) a way of achieving something; **4.** **path (to something)** (*computing*) the logical location of a file or directory.

<sup>25</sup>**fulfil** [v] (*British English*) (*North American English* **fulfill**) **1. fulfil something** to do or have what is required or necessary; **2. fulfil something** to have a particular role or purpose; **3. fulfil something** to do or achieve what has hoped for or expected.

<sup>26</sup>**long-term** [usually before noun] **1.** that will last or have an effect over a long period of time into the future; **2.** that has lasted a long time & is not likely to change or be solved quickly.

<sup>27</sup>**sound** [n] **1.** [countable] something that can be heard; **2.** [uncountable] continuous movements (called **vibrations**) that travel through air or water & can be heard when they reach a person's or an animal's ear; **3.** [uncountable] what you can hear coming from a television, radio, etc., or as part of a film; [v] (not usually used in the progressive tenses) **1. linking verb** to give a particular impression when heard or read about. In spoken English, people often use **like** instead of **as if** or **as though** in this meaning. This is not correct in academic English. **Like** can be used before a noun phrase but not before a clause.; **2. (-sounding)** (in adjectives) giving the impression of being something; **3.** [intransitive, transitive] to give a signal such as a warning by making a sound; **4.** [transitive] to express a particular opinion about a situation or idea; [a] (**sounder, soundest**) **1.** sensible; that can be relied on & that will probably give good results; **2.** in good condition; not damaged or hurt; **3.** [only before noun] good & thorough.

<sup>28</sup>**advice** [n] [uncountable] an opinion or a suggestion about what somebody should do in a particular situation.

<sup>29</sup>**select** [v] **1.** to choose somebody/something from a group of people or things, usually according to a system; **2. select something (from something)** to mark something on a computer screen for a particular purpose; to choose something on a computer screen, especially from a menu; **select for/against something** (*biology*) (in terms of evolution) [phrasal verb] to be the deciding factor in whether a particular living thing or characteristic of a living thing survives; [a] [only before noun] carefully chosen as the best out of a larger group of people or things.

<sup>30</sup>**thesis** [n] (plural **theses**) **1.** a statement or an opinion that is discussed in a logical way & presented with evidence in order to prove that is true; **2. thesis on something** a long piece of writing completely by a student as part of a university degree, based on their own research.

<sup>31</sup>**postdoctoral** [a] [usually before noun] connected with advanced research or study that is done after a PhD has been completed.

<sup>32</sup>**adviser** [n] (also **advisor**) a person who gives advice, especially somebody who knows a lot about a particular subject.

jobs in academia<sup>33</sup>, government<sup>34</sup> laboratories<sup>35</sup>, & industry<sup>36</sup>; preparing<sup>37</sup> for an employment<sup>38</sup> interview<sup>39</sup>; & defining<sup>40</sup> a research program<sup>41 42</sup>. The guidance<sup>43</sup> offered<sup>44 45</sup> in *A Ph.D. Is Not Enough!* will help you make your oral<sup>46</sup> presentations<sup>47</sup> more effective<sup>48</sup>, your journal<sup>49</sup> articles<sup>50</sup> more compelling<sup>51</sup>, & your grant<sup>52</sup> proposals<sup>53</sup> more successful<sup>54</sup>.

A classic guide for recent & soon-to-be graduates, *A Ph.D. Is Not Enough!* remains required reading for anyone on the

<sup>33</sup>**academia** [n] (also **academe**) [uncountable] the world of research & education at universities, & the people involved in it.

<sup>34</sup>**government** [n] **1.** [countable + singular or plural verb, uncountable] (often **the Government**) (abbr., **govt**) the group of people & the institutions connected with them that are responsible for controlling a country or state; **2.** [uncountable] a particular system or method of controlling a country; **3.** [uncountable] the activity or manner of controlling a country.

<sup>35</sup>**laboratory** [n] (plural **laboratories**) (also *informal lab*) a room or building containing equipment for scientific experiments, research or teaching, or for making drugs or chemicals.

<sup>36</sup>**industry** [n] (plural **industries**) **1.** [countable] the people & activities involved in producing a particular thing, or in providing a particular service; **2.** [uncountable] the production of goods from raw materials, especially in factories; **3.** [uncountable] (*formal*) the quality of working hard.

<sup>37</sup>**prepare** [v] **1.** [transitive] to make something/somebody ready to be used or to do something; **2.** [intransitive, transitive] to make yourself ready to do something or for something that you expect to happen; **3.** [transitive] **prepare something** to make food ready to be eaten; **4.** [transitive] **prepare something (from something)** to make a medicine or chemical substance, e.g. by mixing other substances together; **prepare the ground (for something)** [idiom] to make it possible or easier for something to happen or to be achieved.

<sup>38</sup>**employment** [n] [uncountable] **1.** work, especially when it is done to earn money; the state of being employed; **2.** the situation in which people have work; the number of people who have work in a country or area, OPPOSITE: **unemployment**; **3.** **employment (of somebody)** the act of employing somebody; **4.** **employment (of something)** the use of something.

<sup>39</sup>**interview** [n] **1.** a private meeting between people when questions are asked & answered; **2.** a conversation in which somebody, especially a famous person, is asked questions by a journalist in order to find out about their work & opinions & that is printed in a newspaper, shown on television, etc.; **3.** a formal meeting at which somebody is asked questions to see whether they are suitable for a particular job, or for a course of study at a college, university, etc.; **4.** **interview (with somebody)** a formal meeting at which somebody is asked questions about a crime by the police; [v] **1.** [transitive] to ask somebody questions at a private meeting; **2.** [transitive] **interview somebody (about something)** to ask somebody questions about their life, opinions, etc., especially on the radio or television or for a newspaper or magazine; **3.** [transitive] **interview somebody (for something)** to talk to somebody & ask them questions at a formal meeting in order to find out whether they are suitable for a job, course or study, etc.; **4.** [intransitive] **interview (for something)** (*especially North American English*) to talk to somebody & answer questions at a formal meeting in order to get a job, a place on a course of study, etc.

<sup>40</sup>**define** [v] **1.** to describe or show exactly the nature or extent of something; **2.** to say or explain what the meaning of a word or phrase is; **3.** to form or establish the essential character of something; **4.** **define something** to show clearly the outline or position of something.

<sup>41</sup>**program** [n] **1.** (*computing*) a set of instructions in code that control the operations or functions of a computer; **2.** (*North American English*) = **programme**; [v] **1.** to give a computer, etc. a set of instructions to make it perform a particular task; **2.** (*North American English*) = **programme**.

<sup>42</sup>**programme** [n] (*British English*) (*North American English program*) **1.** a plan or things that will be done or included in the development of something; **2.** something that people watch on television or listen to on the radio; **3.** **programme (of something)** an organized order of performances or events; **4.** (*North American English*) a course of study; [v] (*British English*) (*North American English program*) [usually passive] to make a person, an animal, etc. behave in a particular way, so that it happens automatically.

<sup>43</sup>**guidance** [n] [uncountable] **1.** help or advice that is given to somebody, especially by somebody in authority; **2.** the process of controlling the direction or position of something using special equipment.

<sup>44</sup>**offer** [v] **1.** [transitive] to give or provide something; **2.** [transitive] to say that you are willing to give something to somebody or to do something for somebody; **have something to offer** [idiom] to have something available that somebody wants.

<sup>45</sup>**offer** [n] **1.** an act of saying that you are willing to do something for somebody or give something to somebody; **2.** **offer (of something)** an amount of money that somebody is willing to pay for something; **3.** a reduction in the normal price of something, usually for a short period of time; **on offer** [idiom] that can be bought, used, etc.

<sup>46</sup>**oral** [a] **1.** [usually before noun] spoken rather than written, OPPOSITE: **written**; **2.** [only before noun] connected with the mouth.

<sup>47</sup>**presentation** [n] **1.** [countable, uncountable] the act of showing or offering information or ideas for other people to consider; an occasion when this happens; **2.** [countable, uncountable] **presentation of something** the way that somebody/something is shown or described; **3.** [uncountable] the act of giving or showing something to somebody in a formal situation; **4.** [countable, uncountable] (*medical*) the way that a condition or patient is or appears; the occasion when a condition or patient is seen or examined.

<sup>48</sup>**effective** [a] **1.** producing the result that is wanted or intended; producing a successful result, OPPOSITE: **ineffective**; **2.** [only before noun] real or actual, although not official intended; **3.** (of laws & rules) in use.

<sup>49</sup>**journal** [n] **1.** a newspaper or magazine that deals with a particular subject or profession; **2.** a written record of the things you do or see every day.

<sup>50</sup>**article** [n] **1.** a piece of writing about a particular subject in a newspaper, magazine or journal; **2.** (*law*) a separate item in a legal document, agreement or contract; **3.** **article (of something)** (*formal*) a particular item, object or separate thing, especially 1 of a set, SYNONYM: **item**; **4.** (*grammar*) the words *a* & *an* (**the indefinite article**) or *the* (**the definite article**); **article of faith** [idiom] something that you believe very strongly, as if it were a religious belief.

<sup>51</sup>**compelling** [a] **1.** that makes you think it is true or valid; **2.** making you pay attention through being so interesting & exciting; **3.** that cannot be resisted.

<sup>52</sup>**grant** [v] **1.** [often passive] to agree to give somebody what they ask for, especially formal or legal permission to do something; **2.** **grant (that)** ... to admit that something is true, although you may not like or agree with it; [n] **1.** [countable] a sum of money given by a government or other organization for a particular purpose; **2.** [uncountable] **grant (of something) (to somebody)** the action of granting something.

<sup>53</sup>**proposal** [n] **1.** a formal suggestion or plan; **2.** **proposal (that ...)** an explanation suggested for people to consider.

<sup>54</sup>**successful** [a] **1.** achieving your aims or what was intended, OPPOSITE: **unsuccessful**; **2.** having become popular &/or made a lot of money.

threshold<sup>55</sup> of a career in science. This new edition<sup>56</sup> includes 2 new chapters<sup>57</sup> & is revised & updated<sup>58</sup> throughout<sup>59</sup> to reflect<sup>60</sup> how the revolution<sup>61</sup> in electronic communication<sup>62</sup> has transformed<sup>63</sup> the field.”

## Editorial Reviews

### Review

- “It took me over 40 years to learn from experience what can be learned in 1 hour from this guide.” – Carl Djerassi
- “Breezily<sup>64</sup> written, irreverent<sup>65</sup>, & filled with useful information. I wish something like it had been available<sup>66</sup> when I was starting out.” – Michael Weber, Cancer Center Director, University of Virginia, Charlottesville
- “I loved *A PhD Is Not Enough!* I couldn’t put it down. His writing is delightful<sup>67</sup>, & he is on target<sup>68</sup> with virtually<sup>69</sup> all of his advice.” – Steven H. Strogatz, author of *The Joy of X*

### About the Author

“A Senior Scientist at Sandia National Laboratories, PETER J. FEIBELMAN received a Ph.D. in Physics from the University of California at San Diego, did postdoctoral research at the C.E.N. Saclay (France) and the University of Illinois (Urbana), and taught for three years at Stony Brook University. Feibelman lives in Albuquerque, New Mexico. ”

## Preface: What This Book Is About

### 1.1 Do You See Yourself in This Picture?

“A set of nonfiction vignettes illustrating some of the ways that young scientists make their lives more unpleasant than necessary or fail entirely to establish themselves in a research career.”

### 1.2 Advice from a Dinosaur?

“Can you expect someone to be an effective mentor who emerged into the scientific marketplace in a world that looked very different?”

<sup>55</sup>**threshold** [n] **1.** [countable] the level at which something starts to happen or have an effect; **2.** [singular] the point just before a new situation or period begins.

<sup>56</sup>**edition** [n] **1.** (abbr., **ed.**) **edition (of something)** the total number of copies of a book, newspaper or magazine published at 1 time; **2.** the form in which a book is published.

<sup>57</sup>**chapter** [n] **1.** (abbr., **chap.**) a separate section of a book, usually with a number or title; **2.** a period of time in history or a person’s life.

<sup>58</sup>**update** [v] **update something** to get or give somebody the most recent information about something; to add the most recent information to something; [n] **update (on something)** a report that gives the most recent information about something; a new version of something containing the most recent information.

<sup>59</sup>**throughout** [prep, adv] **1.** in or into every part of something; **2.** during the whole period of time of something.

<sup>60</sup>**reflect** [v] **1.** [transitive] to show or be a sign of what something is like or how somebody thinks or feels; **2.** [transitive] to throw back light, heat, sound, etc. from a surface; **3.** [intransitive, transitive] to think carefully & deeply about something.

<sup>61</sup>**revolution** [n] **1.** [countable, uncountable] a great change in conditions, ways of working, beliefs, etc. that affects large numbers of people; **2.** [countable, uncountable] an attempt, by a large number of people, to change the government of a country, especially by violent action; **3.** [countable, uncountable] a complete circular movement around a point.

<sup>62</sup>**communication** [n] **1.** [uncountable] the activity or process of expressing ideas & feelings or of giving people information. In business, **communication** often describes the activity or process of giving information to the public, e.g. in commercials.; **2.** [uncountable] (**communications** [plural]) methods of sending information, especially telephones, radio, computers, etc.; **3.** (**communications**) [plural] methods of traveling or transporting goods, such as roads & railways; **4.** [countable] a message, letter, email or telephone call.

<sup>63</sup>**transform** [v] **1. transform something/somebody (from something) (into/to something)** to change the form of something/somebody, SYNONYM: **convert**; **2. transform something/somebody** to completely change the appearance or character of something/somebody, especially so that it is better; **3. transform something (into/to something) (mathematics)** to change a shape, expression or function by transformation.

<sup>64</sup>**breezily** [adv] in a cheerful & relaxed way.

<sup>65</sup>**irreverent** [a] (*usually approving*) not showing respect to somebody/something that other people usually respect.

<sup>66</sup>**available** [a] **1.** (of things) that you can use or obtain, OPPOSITE: **unavailable**; **2. available (for something)** (of a person) free or willing to do something, OPPOSITE: **unavailable**.

<sup>67</sup>**delightful** [a] very pleasant, SYNONYM: **charming**.

<sup>68</sup>NQBH: **targed?**

<sup>69</sup>**virtually** [adv] **1.** almost or very nearly, so that any slight difference is not important; **2.** by the use of computer software that makes something appear to exist; **3.** by means of computers & computer networks.

### 1.3 Important Choices: A Thesis Adviser, a Postdoctoral Job

“A discussion of what to consider: young adviser versus an older one, a superstar versus a journeyman, a small group versus a “factory.” Understanding & attending to *your* interests as a postdoc.”

### 1.4 Giving Talks

“Preparing talks that will make people want to hire & keep you & that will make the information you present easy to assimilate.”

### 1.5 Writing Papers: Publishing Without Perishing

“Why it is important to write good papers. When to write up your work, how to draw the reader in, how to draw attention to your results.”

### 1.6 From Here to Tenure: Choosing a Career Path

“An unsentimental comparison of the merits of jobs in academia, industry, & in government laboratories.”

### 1.7 Job Interviews

“What will happen on your interview trip; the questions you had better be prepared to answer.”

### 1.8 Getting Funded

“What goes into an effective grant proposal; how & when to start writing one.”

### 1.9 Establishing a Research Program

“Tuning your research efforts to your own capabilities & your situation in life; e.g., why not to start a 5-year project when you have a 2-year postdoctoral appointment.”

### 1.10 A Survival Checklist

“Do not attempt a takeoff before being sure the flaps are down.”

### 1.11 Afterthoughts

“A behaviorist approach to professional success.”

# Bibliography

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# Bibliography

Feibelman, Peter J. (2011). *A PhD Is Not Enough!: A Guide to Survival in Science*. Basic Books, p. 176.