

## **How Long Does it Take to Earn a Ph.D. in Engineering: A Case Study**

**Wayne E. Whiteman, Ph.D., P.E.  
Woodruff School of Mechanical Engineering  
Georgia Institute of Technology  
Atlanta, Georgia 30332-0405**

### Abstract

A case study is conducted of the length of time it takes to earn a Ph.D. in engineering. Four hundred twenty-one individuals who earned their Ph.D. from the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology in Atlanta, Georgia are studied. This case study looks at data over nearly a twenty year period from 1985 to 2004. The individuals earned doctorates in the disciplines of mechanical engineering, nuclear and radiological engineering, and health physics. The study focuses on two major subcategories; the time to earn a Ph.D. beyond a Bachelor's degree, and the time to earn a Ph.D. beyond a Master of Science degree. Various analyses are conducted and some comparisons are made with previous studies.

### Introduction and Background

This paper presents a case study that was conducted to determine the length of time it takes to earn a Ph.D. in engineering. The data for this study was gathered at the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology in Atlanta, Georgia.

Previous studies suggest that the time to the doctorate in science and engineering fields has been lengthening. In a study conducted by Tuckman and others on data from 1967 to 1986, the median total time to doctorate beyond the undergraduate degree increased from 7.09 years to 7.83 years in the field of engineering.<sup>1</sup> The mean total time during this same time frame rose from 8.39 years with a standard deviation of 4.49 years to a mean total time of 9.27 years with a standard deviation of 4.88 years.

Interestingly, another study in 1995 by Massy and Goldman<sup>2</sup> found that attainment rates (percentage of students who eventually attain the Ph.D. degree) correlate positively with time-to-degree calculations. A higher percentage of students attain the degree if they complete their studies relatively quickly. Their study found that those students who took longer, struggle to attain the degree, and may never complete the degree requirements. Another interesting observation of this study was that the "slow tail" of graduates tends to take longer to get the degree in the less elite institutional segments. This effect appeared more pronounced in public than private institutions.

A study of the relationship between disciplines and doctorates completed by Baird in 1990<sup>3</sup> found that the mean time for completion of the PhD in mechanical engineering was 7 years beyond the bachelor degree. The slowest tenth of graduates completed in 8.6 years, while the fastest tenth completed in 5.5 years.

#### Characteristics of this study

Four hundred twenty-one individuals who earned a Ph.D. in the Woodruff School of Mechanical Engineering were studied. Individuals who started, but did not complete their degree, were not included.

The time to complete the Ph.D. degree was computed by taking the graduation semester and subtracting the time from the matriculation semester into the Ph.D. program. The time for each student was rounded off to the nearest one-half year. Both full-time and part-time students were included in the study. The time for earning the degree included any break periods when a student might have not been actively working on the completion of the degree. When compared to other studies, this type of computation is sometimes referred to as “total time to doctorate.” Some studies also look at “registered time to doctorate” and do not include time that students are not enrolled. There was no attempt in the current study to compute “registered time to doctorate.”

The Woodruff School of Mechanical Engineering at Georgia Tech granted degrees in the disciplines of mechanical engineering, nuclear and radiological engineering, and health physics during the period studied. Data was analyzed for students who started entering the Ph.D. Program in 1985 and those who had completed their degree by 2004. As such, the study covered approximately a twenty year period. The study focused on two major subcategories; the time to earn a Ph.D. beyond a Bachelor’s degree, and the time to earn a Ph.D. beyond a Master of Science degree.

#### Results: Time to Earn a Ph.D. beyond a Bachelor’s Degree

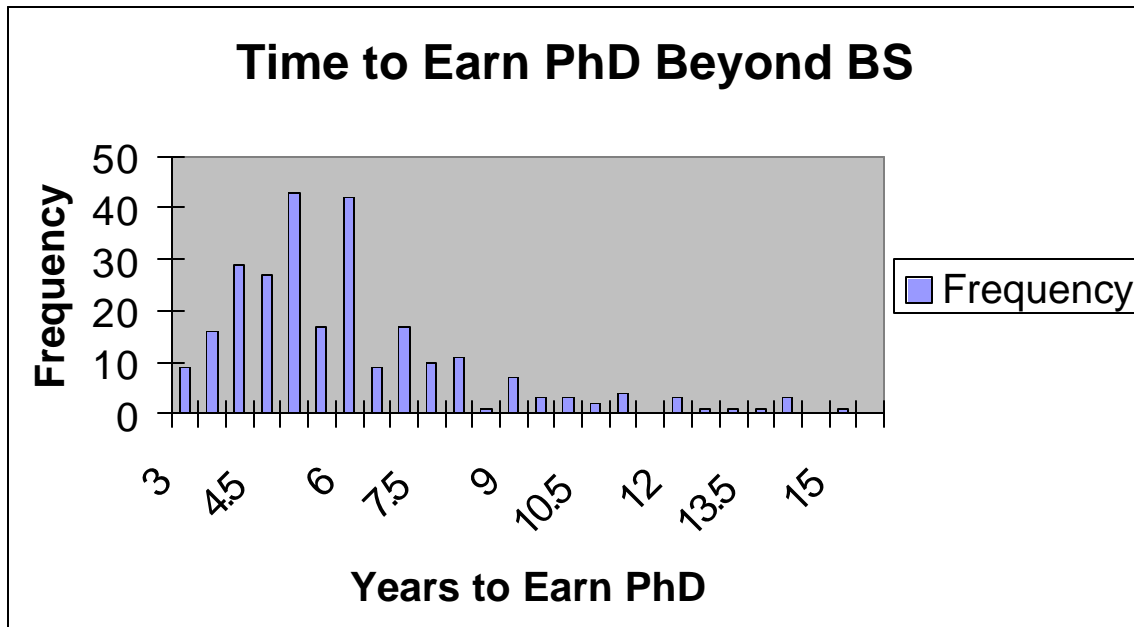
This section contains the results of the time to earn a Ph.D. degree beyond a Bachelor’s Degree. In each individual case, an M.S. degree may or may not have been additionally earned during the time period. Table 1 shows the results for the 260 students in this category. Column 1 is the number of years to earn the Ph.D. degree. Column 2 is the number of students in the particular category.

Table 1:

<i>Years</i>	<i>Frequency</i>
3	9
3.5	16
4	29
4.5	27
5	43
5.5	17
6	42
6.5	9
7	17
7.5	10
8	11
8.5	1
9	7
9.5	3
10	3
10.5	2
11	4
11.5	0
12	3
12.5	1
13	1
13.5	1
14	3
14.5	0
15	1
More	0

Figure 1 shows a histogram of this data. The y-axis represents the frequency of the number of students requiring the specific years for completion of the Ph.D. The number of years to completion is represented on the x-axis.

Figure 1:



The mean number of years for completing the Ph.D. degree beyond the Bachelor's degree was 6 years with a standard deviation of 2.25 years. The median time for completion was 5.5 years. The shortest time for completion was 3 years, and the longest time for completion was 15 years.

Next, to determine if there were any trends in the completion time over the twenty year period, averages of the data were calculated for five year segments. The average completion time during the years of 1985 to 1989 was 6.4 years; 1990 to 1994 was 5.9 years; 1995 to 1999 was 5.5 years; and 2000 to 2004 was 6.3 years. As such, there was no discernable trend in this analysis.

#### Results: Time to Earn a Ph.D. beyond a Master of Science Degree

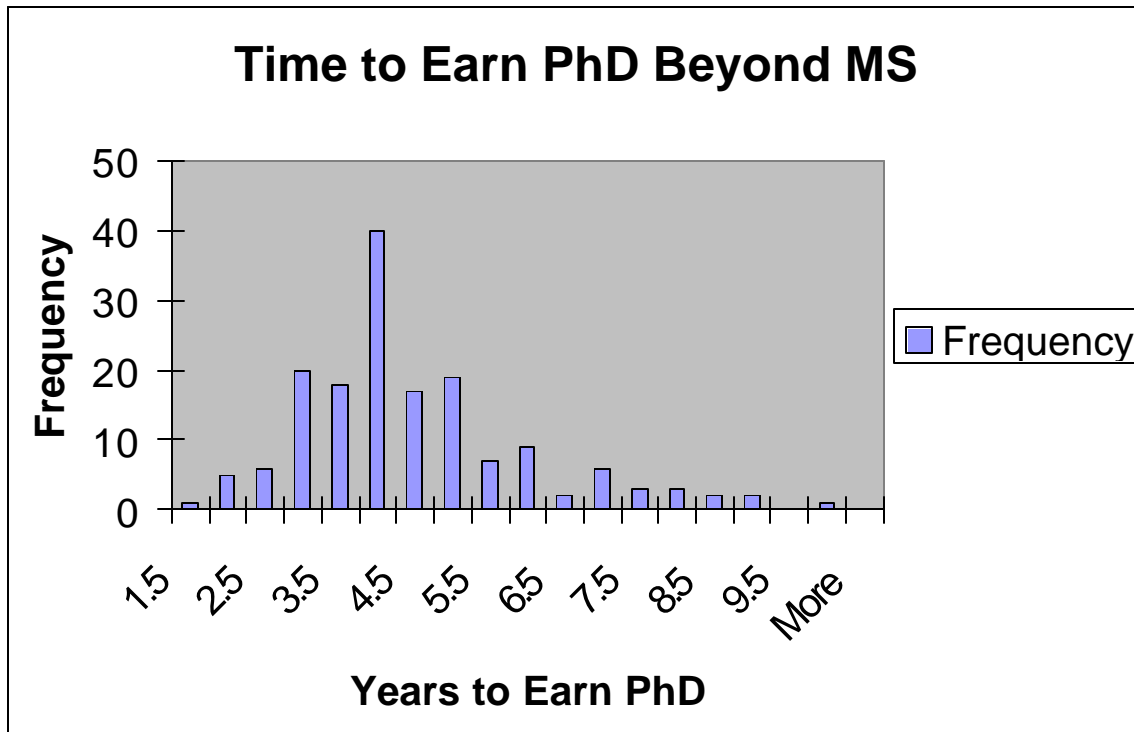
This section contains the results of the time to earn a Ph.D. degree beyond a Master of Science Degree. Table 2 shows the results for the 161 students in this category. Again, column 1 is the number of years to earn the Ph.D. degree and column 2 is the number of students in the particular category.

Table 2:

<i>Years</i>	<i>Frequency</i>
1.5	1
2	5
2.5	6
3	20
3.5	18
4	40
4.5	17
5	19
5.5	7
6	9
6.5	2
7	6
7.5	3
8	3
8.5	2
9	2
9.5	0
10	1
More	0

Figure 2 shows a histogram of this data. As in Figure 1, the y-axis represents the frequency of the number of students requiring the specific years for completion of the Ph.D. The number of years to completion is represented on the x-axis.

Figure 2:



The mean number of years for completing the Ph.D. degree beyond the Master's degree level was 4.5 years with a standard deviation of 1.54 years. The median time for completion was 4 years. The shortest time for completion was 1.5 years, and the longest time for completion was 10 years.

Again, to determine if there were any trends in the completion time over the twenty year period, averages of the data were calculated for five year segments. The average completion time during the years of 1985 to 1989 was 3.9 years; 1990 to 1994 was 4.5 years; 1995 to 1999 was 4.4 years; and 2000 to 2004 was 4.8 years. This analysis shows that there is only a slight trend toward the completion time lengthening.

### Conclusions

In comparing the results of the current study with the earlier studies cited in the Introduction and Background section, the time to completion of the Ph.D. degree at the Woodruff School of Mechanical Engineering at Georgia Tech is slightly less, but quite comparable. There is no conclusive evidence in the current study that the time to completion of the doctorate has been lengthening. It is interesting to note the distribution and range of times, along with the running average of changes in the data over the period studied. Given the ongoing concern in academia regarding the time it takes to finish the Ph.D. degree, periodic studies of this nature are helpful in characterizing historical trends.

## References

- <sup>1</sup> Tuckman, Howard, Susan Coyle, and Yupin Bae, *On Time to the Doctorate: A Study of the Increased Time to Complete Doctorates in Science and Engineering*, National Academy Press, Washington, D.C., 1990.
- <sup>2</sup> Massy, William F., and Charles A. Goldman, *The Production and Utilization of Science and Engineering Doctorates in the United States*, Stanford Institute for Higher Education Research, Stanford, CA, 1995.
- <sup>3</sup> Baird, Leonard L., Disciplines and Doctorates: *The Relationships Between Program Characteristics and the Duration of Doctoral Study*, Research in Higher Education, Vol. 31, No. 4, 1990.
- <sup>4</sup> National Center for Educational Statistics, *Time to Complete a Doctorate Degree, by Field of Study*, Report No: NCES -96-794, U.S. Department of Education, Washington D.C., 1996.

## Biography

### WAYNE E. WHITEMAN

Wayne E. Whiteman is a Senior Academic Professional and Director of the Office of Student Services in the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. He received his BS degree from the United States Military Academy in 1979, an MSCE from MIT in 1987, and a Ph.D. in Mechanical Engineering from Georgia Tech in 1996. Whiteman is a retired Colonel and completed 24 years of active military service. He served on the West Point faculty from 1987 to 1990, and 1998 to 2003.