

# The Academic Roots and Evolution of Real Estate Appraisal<sup>1</sup>

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## abstract

Real estate appraisal as a profession and real estate as a separate field of study in the United States are approximately one hundred years old. By reviewing the way the appraisal field has changed, we see that theory, methods, and practices continue to evolve. To survive over the long run requires constant learning and adaptation to changing sources of demand, new technology, and a shifting landscape of competition. In this article, we acknowledge some of the thought leaders in valuation, essentially those from the U.S. who built the current practice of appraisal, and those who will follow in their footsteps.

It may seem surprising to those toiling in the field, but real estate appraisal as a profession is quite young; 2002 could be viewed as its century birthday. Of course, the basic mathematical, statistical, and analytical tools used in real estate appraisal were developed over the prior three hundred years, but the field started to develop a separate identity in about 1902. For every profession, it is useful to pause and reflect on developments over the past hundred years or so and who influenced these changes. Without taking the time to reflect on “change,” it becomes easy to believe that current practices are sufficient and that we can simply become more experienced at doing the same thing we did last month and last year. But viewed from a longer perspective, we see that business practices have changed dramatically and will likely continue to change. “Business as usual” will never last more than part of a single generation. Change, which implies that someone loses and someone gains, is always accompanied by obstacles and pain. We pay heed here to the fathers of change, essentially those who have influenced the theory and methods used by appraisers.

Appraisal has progressed far from the labor-intensive and uncertain theories of establishing value, despite many barriers along the way. Because the industry started with no professional society and no formal education or designations, there has been a broad range of sophistication among appraisers. With more opportunities for formal education and professional societies such as the Appraisal Institute available, there should be less variation in the quality of appraisal practice today. We note early on, however, that an impediment to greater progress in the application of advanced methodology has been the litigious nature of our society. Litigation paranoia limits progress within the field if individual appraisers are reluctant to experiment and learn to apply new techniques.

1. This summary article is based on a presentation made to the Cardinal Chapter of the Appraisal Institute, December 7, 2002, with assistance from the Y. T. Lum Library of the Appraisal Institute as well as the Homer Hoyt Institute. Support for Sergey Markosyan has been provided by the Muskie/Freedom Support Act Graduate Fellowship Program, a program of the Bureau of Educational and Cultural Affairs. A PowerPoint slide presentation that accompanies this paper is available on-line from the University of Cincinnati Real Estate Center Web site at [www.cba.uc.edu/getreal/FACULTY/Miller/Appraisal\\_Presentation.ppt](http://www.cba.uc.edu/getreal/FACULTY/Miller/Appraisal_Presentation.ppt).



In the process of doing our research, we came across one very interesting trend. All of the advancements in appraisal were made by individuals who were linked to one another in some way. In other words, nearly all the contributors to appraisal methodology studied and worked with other thought leaders. No one worked alone and independently originated a major improvement or refinement in the field of appraisal. Contributions have always come by building on the ideas of others, and it was fascinating to see who worked with whom or under whom during their apprentice years. From an academic point of view, we see that most of the leaders, but not all, were based at major universities that continue to have respected real estate programs. Aside from their intellectual prowess, these professors were in a position to be critical of current methods without the inherent vulnerability of a practicing appraiser.

We readily admit that many important contributors to the field are not reviewed here, and we apologize in advance to any offending omissions, but space limitations require a very condensed and all-star review. Also, few innovations from recent years are discussed, because only time will tell us how much influence these ideas will have on the practice of appraisal.

We created Table 1, Appraisal History Timeline, to illustrate the development of real estate appraisal. The table identifies four major periods in its evolution, which are defined briefly below. The table then shows the key influences—the people, technological inventions, and theories—that shaped the development of appraisal theory and practice within each of these time periods.<sup>2</sup>

We did not include the basic mathematical, statistical, and analytical tools and theories developed in the 18th and 19th centuries. Although these breakthroughs allowed the birth of appraisal, they were also essential to many other professions and to science in general.<sup>3</sup> We do, however, review these briefly in the text that follows.

## **Periods in the Development of Real Estate Appraisal**

**Three Approaches Period—Beginning in U.S. of Real Estate Appraisal as Academic Field (1900–1940s)**, which is characterized by the development of the “three methods” of determining value by fairly

simple calculations. The first real estate academic programs and organizations were founded during this period, and the educational curriculum needed by professionals was born.

**Theory Refinement Period (1950—first half of the 1960s)**, which is characterized by improvements in sampling and definitions such as the most probable selling price approach to deriving fair market value. Ellwood capitalization tables were published and simple electronic or mechanical calculators became available.

**New Methods and Techniques Period (second half of the 1960s—the beginning of the 1980s)**, which is characterized by promotion of discounted cash flow techniques for estimating investment values, widespread use of electronic calculators, and refinement of capitalization theory.

**Personal Computer, the Internet, and Real-Time Data Period (second half of the 1980s–1990s)**, which is characterized by growth in the use of personal computers, integration of the Internet for communication and real-time data, and development of automated valuation models (AVMs).

## **Pre-1900: People, Events, Theories, and Technology—The Building Blocks**

The basic mathematical tools and economic theories created in the 18th and 19th centuries were essential for real estate to become a separate specialization. Adam Smith (1721–1790) wrote the first notable economic work, *Wealth of Nations*, in which he described how markets operate. This work would help future thinkers substantiate the importance of valuation, because Smith showed that markets could not function efficiently without accurate valuation. When reliable property values are not available, mortgage markets cannot evolve and real estate markets remain extremely inefficient, inhibiting access to important capital resources necessary for the growth of many developing economies.

At the same time, mathematicians were developing better models for the analysis of risk and probability theory. For example, in 1662 Pascal wrote on sampling and in 1738 Bernoulli wrote on risk.<sup>4</sup> These tools would become far more important in the 19th

2. Note that a number of the contributors described in this article were active in more than one period.

3. For a great review of the essential mathematical tools, including probability and sampling theory, see *Against the Gods: The Remarkable Story of Risk* by Peter Bernstein (New York: John Wiley & Sons, 1996).

4. Daniel Bernoulli was a brilliant Swiss mathematician who wrote a paper in 1738 on risk and the contributions of human capital. Written in Latin, this work was essentially “a new theory on the measurement of risk.”



and 20th centuries. Within the economics arena, James Anderson (1739–1808) and David Ricardo (1772–1823) developed the theory of appropriate rent and returns on land, which helped lead to the notion of capitalizing future returns into present values.

The next generation of contributors worked out better tools that were used more directly in the appraisal of real estate. Alfred Marshall (1824–1924) formally presented the idea of capitalized values of land and buildings. Irving Fisher (1867–1947) developed and extended the theory of compound interest and maximum productivity, a concept that later became formalized as highest and best use. William Inwood (1771–1843) published the first present-value, future-value interest rate factors, level payment, and sinking fund tables in 1811, which were extended and refined by Hoskold in 1880. So as the end of the 19th century approached, the means were available to start writing the various “cook-books” for appraising real estate, each chef espousing a personal view on the appropriate ingredients and process.

### Three Approaches Period—Beginning in U.S of Real Estate Appraisal as Academic Field

The period from about 1900 until the early 1940s marks the beginning of real estate as an academic field and the development of the three approaches to value. The seminal thinkers in this period included Richard Ely, Richard Hurd, Ernest Fisher, Frederick Babcock, Homer Hoyt, and Arthur Weimer.

#### Richard Ely: The Father of Real Estate

Richard T. Ely (1854–1943) can be considered the father of real estate as an academic field, not only in the United States but perhaps the world. This famous and highly respected American economist received his PhD at the University of Heidelberg, Germany. In 1892, he became head of the University of Wisconsin’s School of Economics, Political Science and History, which was organized that year. During the period 1892–1920, he wrote and published many articles dealing with economic and social issues. A believer in the invisible hand of the markets, he was tried for heresy in Wisconsin near the turn of the century. Later publicity over his trial and the support of academics around the country resulted in the concept of “tenure” for professors,

who would be academically free to speak the truth as they saw it.

Having long been interested in land economics issues, Ely started teaching a course on this subject in 1919. This offering can be considered the first real estate course taught at any American university. In 1920, he found funds to establish the Institute for Research in Land and Public Utility at the University of Wisconsin. In the beginning, the Institute was primarily a research, rather than an educational, organization. However, with time the Institute influenced the development of courses within a program called Land and Public Utility Economics. Founded in 1925, this program became a predecessor of the Department of Real Estate and Urban Land Economics at the University of Wisconsin. However, Ely’s goal to create a professional real estate organization was not achieved until 1928, when appraisal was officially recognized as a significant branch of specialization within the National Association of Real Estate Boards (NAREB).<sup>5</sup>

In 1924, Ely and Morehouse co-authored *Elements of Land Economics*. This book was just one of many significant works on real estate and appraisal that were written or edited by Ely and published during the 1920s. Two of them, *Principles of Real Estate Practice* (1924) by Ernest M. Fisher and *The Appraisal of Real Estate* (1924) by Frederick M. Babcock, were pioneering contributions to appraisal methodology and process. As a group, Frederick Babcock, Ernest Fisher, and Richard Ely broke new ground, but one author preceded all of them. Richard Hurd, discussed below, wrote the first appraisal book applied to urban land.

#### Richard Hurd

Richard M. Hurd (1865–1941) wrote *Principles of City Land Values*, which was first published in 1903. This was the first book about the theory of urban land valuation. Hurd analyzed factors and forces influencing the value of property in a city.

In his book, Hurd introduced two types of value: *intrinsic value* and *exchange value*. He defined intrinsic value as the capitalization of the economic or ground rent of a particular property and exchange value as the average of market sales.<sup>6</sup> Thus, exchange value was the precursor of what we call fair market value. He argued that intrinsic value may differ from

5. Under the leadership of John P. Hooker of Chicago, this new division called for balanced appraisals and developed 15 articles as standards of practice. The by-laws of the Appraisal Division, founded in 1931, consisted of four typed pages, compared with more than 100 pages today. See Atkinson (1972) in References.

6. Richard M. Hurd, *Principles of City Land Values* (New York: The Record and Guide, 1924), 145.

**Table 1 Appraisal History Timeline**

Period	People	Technology	Theory
<p><b>Three Approaches Period</b> 1900–1940s</p>	<p>1892 R. Ely became head of U of WI Schl of Econ, which evolved into 1st real estate program</p> <p>1903 R. Hurd wrote <i>Principles of City Land Values</i></p> <p>1924 E. Fisher wrote <i>Principles of Real Estate Practice</i></p> <p>1932 F. Babock wrote <i>Valuation of Real Estate</i></p> <p>1939 H. Hoyt co-wrote <i>Principles of Urban Real Estate</i> with A. Weimer</p>		
<p><b>Theory Refinement Period</b> 1950–first half of 1960s</p>	<p>1949 R. Ratcliff wrote <i>Urban Land Economics</i></p> <p>1951 Appraisal Institute starts writing <i>The Appraisal of Real Estate</i> (aka <i>The Bible</i>) as collaboration</p> <p>1956 P. Wendt wrote <i>Real Estate Appraisal</i></p>	<p>1959 Ellwood Cap Tables</p> <p>Before 1960 Simple calculators and slide rules</p>	<p>Definitions of value and three methods evolve</p> <p>Most probable price approach</p>
<p><b>New Methods and Techniques Period</b> Second half of 1960s–beginning of 1980s</p>	<p>1964 J. Graaskamp joined University of Wisconsin—stayed until 1988</p> <p>1968 Homer Hoyt Institute established</p> <p>1979 Homer Hoyt Institute set up as think tank in Florida by M. Seldin</p>	<p>1968 Electronic calculators available</p> <p>1982 Growth of personal computer use</p>	<p>1970 "Ellwood without Algebra" by C. Akerson</p> <p>Warnings about using three approaches in all cases</p> <p>1977 "Ellwood After Tax" by J. Fisher</p> <p>DCF as valuation technique</p> <p>1979 "Ellwood J Factors" by J. Fisher</p> <p>1981 "Unified Field Theory of the Income Approach to Appraisal" by P. Colwell</p> <p>Capitalization theory refined</p>
<p><b>Personal Computer/Internet/Real-Time Data Period</b> Second half of 1980s–1990s</p>		<p>1992- Internet connectivity present and real time data becomes reality</p> <p>AVMs promoted by Freddie Mac</p>	



exchange value based on a property's unique circumstances. However, the two values are interdependent and exchange value is based on the intrinsic value over the long run. Hurd was the first to introduce the notion of *highest utilization*, or *highest and best use* in modern terminology.

### Ernest Fisher

Ernest McKinley Fisher (b. 1893) was a significant figure in the real estate field beginning in the 1920s. His influence is seen through the list of famous contributors to valuation theory fortunate enough to be mentored by him, including Frederick Babcock, Homer Hoyt, Arthur Weimer, and Richard Ratcliff.

Before 1923, Fisher himself worked with Richard Ely at the Institute for Research in Land and Public Utility at the University of Wisconsin. In 1924, Fisher wrote *Principles of Real Estate Practice*, which was edited by Richard Ely and published with the cooperation of the Institute. The work served primarily as a textbook for courses in real estate, which were just starting to become formalized.

At the beginning of the 1930s, Fisher was a professor of real estate at the School of Business Administration of the University of Michigan. Babcock worked there during this period; in 1932 Babcock, with Fisher's help, wrote *The Valuation of Real Estate*. Another prominent real estate researcher, Richard Ratcliff, was Fisher's doctoral student at the University of Michigan.

In the 1930s, Fisher also worked as the chief economist at the Federal Housing Administration (FHA). In part to keep these bright colleagues working and engaged in a burgeoning field while the economy struggled, Fisher employed Babcock, Hoyt, and Weimer at the FHA, challenging them with the most difficult assignments possible.

### Frederick Babcock

Frederick M. Babcock (1897–1983) was the author of the first generalized American appraisal book. In 1924, he wrote *The Appraisal of Real Estate*, in which Babcock described eight methods of appraising and asserted that the selection of an appropriate method depends on the property type.<sup>7</sup> For example, different methods should be used for appraising commercial and residential properties based on the availability of data, such as income production, that would feed into the various methods.

Perhaps more significant than Babcock's first book was his second, *The Valuation of Real Estate*,

which he wrote in 1932 while a research associate in the Bureau of Business, School of Business Administration of the University of Michigan. As noted earlier, he wrote this book with help from Ernest Fisher, who was a professor of real estate at the same school. *The Valuation of Real Estate* was the first work that attempted to unify all the methods and techniques needed to appraise any kind of property. Babcock described the importance of defining the purpose of an appraisal before starting the property valuation process. He was the first to recognize that the selection of the valuation method depends on the purpose of the appraisal. At the same time, the purpose influences the value obtained as a result of the appraisal. Thus, there is no single parameter of *value*; rather the type of value sought must be defined. The same property may have several different values, each of which is based on the appraisal's purpose. Purchase, normal sale, liquidation, development assemblage, acquisition, property insurance, compensation, and loan security are examples of appraisal purposes that may result in different values.

In *The Valuation of Real Estate*, Babcock divided the purposes of valuation into two large categories. The first one included valuations that assist in making decisions about a property, such as sale, purchase, or investment. The second category included valuations that establish a basis for certain actions with a property that involves others, such as property tax assessment, damage determination, or public acquisition.

He also distinguished the terms of *value* and *market price* as theoretical and factual. Market price, which is based on a selling price, is a fact while value must be defined.

Babcock described seven appraisal methods and emphasized the importance of selecting the proper method given the purpose of a particular appraisal. He also categorized each method under one of the three basic appraisal approaches: the market (comparison) approach with one method, the income approach with four methods, and the cost approach with at least two methods. Babcock considered the income approach to be the preferred method and pointed out that this approach should be used whenever possible. He also advocated using split capitalization rates. In other words, he divided income streams that could be produced by property into two parts: one part related to the buildings and structures and the other to the land. Correspondingly, a

7. In his second book, the number of methods was reduced to seven.



different capitalization rate was attributed to each element and the value of each was calculated separately. Others such as Ratcliff later rejected this component approach, but most academics agreed with Babcock's criticism of trying to apply all three approaches to value on all property appraisals.

As he refined his theories in the 1960s, Babcock argued that it is logically incorrect to correlate the results of an appraisal by using the estimates obtained from the three basic approaches: market (comparison) approach, income approach, and cost approach. He argued that the cost approach cannot be considered relevant to finding market value, because no market data is used in employing this approach; it is merely a default approach, used only by necessity. His paper entitled simply "The Three Approaches" remains a classic in many ways, with its plea for moving the industry away from what he called *cook-book appraisals*.<sup>8</sup> By this term, Babcock meant the application of a particular method whether or not data was available to apply that technique better than some other approach to value. He was critical of appraisals that never considered modified approaches to value based on the information available.

Three other influential contributors to the evolution of real estate, including appraisal, as an academic field were Homer Hoyt, Art Weimer, and later, Richard Ratcliff. They can be considered the protégées of Ernest Fisher and Frederick Babcock.

### Homer Hoyt

Homer Hoyt (1895–1984) received his JD in 1918 and PhD in economics in 1933, both degrees from the University of Chicago. He started his career in real estate in 1925, working as a broker and consultant in Chicago. In 1934, he joined the Federal Housing Administration, where he worked as a principal housing economist until 1940. As mentioned, Babcock, Ratcliff, and Weimer, all influential real estate professionals, worked with him at that time. From 1944 to 1946, Hoyt was a visiting professor of land economics at Massachusetts Institute of Technology and Columbia University. The most famous of his works are *One Hundred Years of Land Values in Chicago: 1830–1933* (1933) and *Principles of Urban Real Estate*, which was written with Arthur

Weimer and published in 1939. There were six more editions of this later work, the last one published in 1978. *One Hundred Years of Land Values in Chicago* remains in print to this day.<sup>9</sup>

In the first edition of their joint book, Weimer and Hoyt stated that the income method is the "soundest approach" in determining property value, which is based "on the forecasting of future returns and the reflections of these in the present value by application of a proper capitalization rate."<sup>10</sup> They considered location, market, legal, governmental, and physical factors to be the most important influences on property value, with the most emphasis on location and market factors.

A successful investor, Hoyt became a fairly wealthy man. One of his significant property holdings in Florida was donated in 1979 to an Institute that bears his name, the Homer Hoyt Institute (HHI), based in North Palm Beach, Florida.<sup>11</sup> The land was sold for several million dollars by Maury Seldin, a professor at American University at the time and a founder of the Homer Hoyt Institute.<sup>12</sup> Weimer, Wendt, Nourse, Kinnard, and Case all participated in this Institute dedicated to improving land-use decisions. To this day, invited scholars and top professionals from around the world come to this think tank to present research and discuss ideas and trends. The Homer Hoyt Institute may be the source of Hoyt's greatest impact.

### Arthur Weimer

Arthur M. Weimer (1909–1987) received his PhD from the University of Chicago in 1934. That year, he joined the Federal Housing Administration as a housing economist, a position he held until 1937. For part of that time, Weimer also worked at the Georgia Institute of Technology (1935–1936). From 1937 to 1979, he was a professor of real estate and urban land economics at Indiana University, Bloomington, where he served as dean of the School of Business from 1939 until 1963. Weimer played an important role in improving the school, still home to Jeffrey Fisher, PhD, who directs the real estate center and remains an active participant in numerous professional organizations.

The most famous work of Weimer is *Principles of Urban Real Estate*, written with Homer Hoyt in 1939

8. Frederick M. Babcock, "The Three Approaches." *The Real Estate Appraiser* (July–August, 1970): 5–9.

9. Hoyt married the Chicago clerk who gave him his limit of five public records each time he visited the property auditor's office. Perhaps had he not fallen in love, he would have written *25 Years of Land Values in Chicago* instead.

10. Arthur M. Weimer and Homer Hoyt, *Principles of Urban Real Estate* (New York, The Ronald Press Co., 1939), 171.

11. HHI evolved from the real estate center at American University under the auspices of Maury Seldin.

12. This Institute continues to be directed by Maury Seldin, Chairman of the Board, Ron Racster, Dean of the Weimer School, and Hal Smith, Director of the Hoyt Fellows, past professors at American University, Ohio State University, and the University of Florida, respectively.



and published for four decades, but his greatest contributions have been felt through his leadership of others. The post-doctoral program at the Homer Hoyt Institute was named the Weimer School of Advanced Studies in Real Estate and Land Economics in 1982.

### Theory Refinement Period

During the 1950s and into the 1960s, real estate appraisal methods were critiqued, discussed, extended, and refined. Leon Ellwood, Richard Ratcliff, and Paul Wendt (whose contributions are discussed under the New Methods and Techniques Period) published the most influential works of this period. Among these, Ellwood, who never pursued a PhD, was one of the leading thinkers on the practice of appraisal. Clearly a man well ahead of his time, had he lived in the age of modern computers, he might have developed software that would have dominated the industry.

### Leon Ellwood

Leon W. Ellwood (1896–1974) began working as an appraiser in Chicago in 1928. In 1944, he moved to New York to take charge of the appraisal division at New York Life Insurance Company. In June 1946, he was awarded the MAI designation. He wrote the *Ellwood Tables for Real Estate Appraising and Financing*, first published in 1959.<sup>13</sup> Ellwood introduced a sophisticated variation on the mortgage-equity analysis technique with capitalization rates based on mortgage terms, expected holding period, and expected appreciation rates, all adjusted for present value. He later refined capitalization rates for stable or growing income streams. Essentially, Ellwood's techniques took into account the actual timing of all the returns to debt and equity, with appropriate discount rates for each. Equivalent to a discounted cash flow, present-value approach to value under strict assumptions, his techniques were never fully embraced by the industry, although they were part of the required educational core for many years.

### Richard Ratcliff

Richard U. Ratcliff (b. 1906) is one of the most important figures in creating modern real estate valuation standards and techniques. He was a reformer of the traditional real estate appraisal frameworks created by Richard Ely, Ernest Fisher, Homer Hoyt, and Frederick Babcock.

Ratcliff received his BA in economics from the University of Wisconsin. He earned his MBA in real estate management and PhD in urban land economics and real estate from the University of Michigan, where he was a student of Ernest Fisher. Fisher influenced Ratcliff's work and employed him in the 1930s at the FHA. In 1944, Ratcliff joined the School of Commerce at the University of Wisconsin as an associate professor. He was the director of the center from 1948 until 1968, helping to establish Wisconsin as one of the leading schools for real estate studies. Later, he worked as a professor of urban land economics and director of the Urban Land Economics Center at the University of British Columbia, Vancouver. After retirement from the University of British Columbia, he moved to Santa Cruz, California, where he became an independent real estate counselor and appraiser.

Richard Ratcliff was a prolific writer. Among his books are *Urban Land Economics* (1949), *Real Estate Analysis* (1961), *Modern Real Estate Valuation: Theory and Application* (1965), and *Valuation for Real Estate Decisions* (1972). He also wrote numerous articles, many of them published in *The Appraisal Journal*.

One noteworthy early work was "Economic Life in the Valuation Procedure," published in *The Journal of the American Institute of Real Estate Appraisers* in January 1938. In this article, Ratcliff demonstrated that estimating the remaining economic life of improvements is an unnecessary step for the valuation of a property using an income approach. He pointed out that the predictable income stream and expected change in value over a reasonable holding period are sufficient. Moreover, Ratcliff demonstrated how different income streams, gross or net, might be capitalized into value, based on the information available.

A second influential article, "Net Income Can't be Split," was published in *The Appraisal Journal* in April 1950. Here, Ratcliff criticized the split capitalization rates advocated by Babcock, where the income stream is divided between land and improvements. He stated that as the capitalization rate reflects the risk of the overall investment and as the risk is equal for the whole property, including land and improvements, the net income produced by the property should be capitalized by a uniform capitalization rate.

13. The most recent edition is the following: Leon W. Ellwood, *Ellwood Tables for Real Estate Appraising and Financing*, 4th ed. (Cambridge, MA: Ballinger Publishing Company for the American Institute of Real Estate Appraisers, 1977).

From 1961 through 1972, Ratcliff wrote three books considered significant contributions to real estate appraisal theory. In these works, Ratcliff stated that valuation is an instrument for the investment decision-making process. He demonstrated that some real estate decisions require more than one value. Subjunctive value ( $V_s$ ), cost of production ( $V_c$ ), and market value ( $V_p$ ) are the three basic values that might be used in the decision-making process. Nevertheless, most decisions require market value. At the same time, Ratcliff introduced a new concept for deriving market value, known as the *most probable selling price for estimating  $V_p$* . This concept included two premises: first, that in the process of valuation the appraiser is making a prediction of the price for which a property can be sold on the market under the particular defined conditions, and second, that there is some uncertainty in each prediction. The prediction made by the appraisal is the most probable price but never a certain price. Therefore, he argued that estimating market value is a process of finding the most probable selling price.

#### **New Methods and Techniques Period**

The third period (from approximately the second half of the 1960s through the beginning of the 1980s) is characterized by further critiques of the three approaches, refinement, and an increasing reliance on new techniques, including discounted cash flow analysis as an approach to valuation. Real estate as an academic subject also expanded rapidly through many universities across the U.S. as the real estate profession gained more prominence.

#### **Paul Wendt**

Paul F. Wendt (1908–2000) was one of the most vocal critics of real estate appraisal practice. He received his PhD in economics from Columbia University. In 1947, he founded the real estate program at the University of California, Berkeley, where he worked until 1972. After moving to the University of Georgia, Athens, in 1972, he founded a similar department. Both programs continue to be prominent academic centers for real estate studies. Wendt remained at the University of Georgia until 1979, when he returned to the University of California, Berkeley. Eventually, he retired in Mexico, where during his last years he remained an active participant in the Homer Hoyt Institute.

The most important works of Paul Wendt include *Real Estate Appraisal: A Critical Analysis of*

*Theory and Practice* (1956), *Real Estate Investment Analysis and Taxation* (1969), co-authored with Alan Cerf, and *Real Estate Appraisal: Review and Outlook* (1974). One of the authors promoting discounted cash flow analysis, Wendt criticized the traditional income approach as too often based on unrealistic assumptions. He rejected direct capitalization and land and residual techniques of capitalization, preferring investment and risk-adjusted approaches to valuation.

#### **William Kinnard**

William Kinnard (1926–2001) received his MBA and PhD degrees from the University of Pennsylvania. In 1965, he joined the University of Connecticut, where he founded the real estate program. During 26 years at the university, he worked as head of the Finance Department, then as director of the Center for Real Estate and Urban Economic Studies, and associate dean and acting dean of the School of Business Administration. Kinnard published numerous articles and several books, including *Income Property Valuation* (1971), which was a complete and up-to-date description of known and applicable income property valuation methods and techniques.<sup>14</sup> Kinnard was a leader and expert on how environmental influences affect property value.

#### **James Arnold Graaskamp**

Often an outspoken critic of the industries he trained students to serve, Graaskamp (1933–1988) was devoted to his students and they to him. His research was strictly applied and practical. He believed that true intellectual beauty resides in “simple truths,” and he abhorred the focus on minutiae among his colleagues almost as much as he abhorred intellectual or educational elitism. Graaskamp helped to organize and systematize real estate analysis. He is considered the founder of feasibility analysis for new development proposals, because of his philosophy that “everything mattered” to the real estate market. You could never know too much or take too holistic an approach in estimating value. He saw real estate as part of a vast business ecosystem. With respect to appraisal, Graaskamp did not develop new theories, but he was insightful and candid when he saw flawed logic, and he was willing to tell everyone so. He was blunt, direct, honest, and often cynical. He promoted DCF analysis as a valuation approach long before personal computers made this an easier task.

14. William N. Kinnard, Jr. *Income Property Valuation* (Lexington, Mass., D.C. Heath, 1971), 291.



Graaskamp became an assistant professor at the University of Wisconsin in 1964 right after he completing his PhD there. He studied with Richard Ratcliff, who immediately hired him. Professors rarely hire their own students; this act says a great deal about Graaskamp's abilities. In 1968, when Ratcliff retired, Graaskamp became the head of the university's real estate program, a post he held for almost 20 years. In the 1970s, he started the first graduate program in real estate in the U.S. In 1985, he became a Fellow of the Homer Hoyt Institute.

Graaskamp believed *highest and best use* to be an arrogant and unrealistic term that presumed more sophistication, creativity, and time for analysis than was really possible in any appraisal. He preferred the less difficult and more realistic assignment of seeking *most probable use*. He also believed discounted cash flow analysis to be a better approach, as it allowed more integration of all the complex components he saw affecting value.

#### **Charles Akerson**

Charles B Akerson (b. 1922) earned a BA from Tufts University in 1947. Since then, he has been in the real estate business. His diverse background includes real estate valuation, brokerage, and construction. His famous article, "Ellwood without Algebra," was published in the July 1970 issue of *The Appraisal Journal*. In this article, Akerson demonstrated how to lay out the Ellwood approach without using algebra. Using simpler math, he handled the most general case of Ellwood, hoping to make the process more comprehensible to appraisers. *Capitalization Theory and Techniques*, another well-known work of Akerson, was published in 1973 and 2000.

#### **Jeffrey D. Fisher**

Jeffrey Fisher (b. 1947) received his PhD from Ohio State University in 1980. Currently, he is the director of the Center for Real Estate Studies and professor of finance and real estate at the Indiana University School of Business. Fisher's many articles have been published in a variety of real estate journals, such as *The Appraisal Journal*, *Real Estate Economics*, *The Real Estate Appraiser and Analyst*, and *The Journal of Real Estate Research*. He is the co-author of several books on real estate, including *Income Property Appraisal* (1991) and *Income Property Valuation* (1994). His work includes two important articles—

"Ellwood After Tax—New Dimensions" (*The Appraisal Journal*, July 1977) and "Ellwood J Factors: A Further Refinement" (*The Appraisal Journal*, January 1979)—in which he shows how Ellwood equates to a discounted cash flow analysis even using after-tax returns. Thus, he extended Ellwood into the equivalent of a DCF valuation analysis even when using after-tax discount rates.

Fisher is the author of RealDCF, sophisticated real estate appraisal and financial analysis software. He also developed the first on-line course for the Appraisal Institute, entitled Internet Search Strategies for Real Estate Appraisers. Fisher is a Homer Hoyt Institute faculty member and remains an active author.

#### **Peter F. Colwell**

Peter Colwell (b. 1943) received his MA in 1969 and PhD in 1973 from Wayne State University. Since 1977, he has taught numerous real estate courses at the University of Illinois, Urbana-Champaign. In addition, he has worked as the university's director of real estate research since 1994. Although he has published several dozen articles on real estate topics in academic journals, one in particular made an enormous contribution to the appraisal field. In 1981, Colwell and Roger Cannaday wrote "A Unified Field Theory of the Income Approach to Appraisal" (Parts I–III), which was published in *The Real Estate Appraiser and Analyst*. In this article, the authors discussed all the known methods and assumptions regarding the income approach to value as well as the DCF approach. They explained the differences in assumptions among the methods as well as how to be consistent in applying assumptions when using multiple techniques. They also showed that all variations of the income approach can be viewed as special cases of the Ellwood technique. To this day, no further theoretical contributions to the income approach to value have surpassed the content included in this 1981 treatise.<sup>15</sup>

#### **Personal Computers, the Internet, and Real-Time Data**

In the fourth and current period (since the mid-1980s), few new theories have had as much impact on the field of appraisal as those described previously. Certainly, there have been contributions in many areas, from the influence of inflation on real estate to

15. Only new models that deal with risk analysis and portfolio valuation have gone beyond the work summarized in this classic article.



the effect of auctions, as well as debates over the separation of business value from property value.

**Automated Valuation Models: From Origins to the Present Time.** Since 1960, a variety of automated valuation models (AVMs) have been developed and expounded upon in the academic literature. These models evolved primarily from what academics call hedonic pricing models based on multiple factor regression models.<sup>16</sup> A hedonic pricing model weighs attributes thought to be important in the estimation of value through a linear statistical process. An independent variable, usually home price, is examined for correlation with dependent variables such as size, number of bedrooms, age, and so forth. The process is called *multiple regression* because several variables are combined at one time. AVMs were run on large mainframe computers in the 1960–1980 period, on personal computers in the 1980–1998 period, and now on Web-based servers that include huge databases. The typical model has the form:

$$\text{Selling Price} = a + b_1 * X_1 + b_2 * X_2 + b_3 * X_3 \dots b_n * X_n \\ + \text{error}$$

Where the “a” is a constant term, the “b’s” are regression coefficients that indicate the influence of each variable X on selling price. Of course, errors occur in fitting any model. The X variables may be non-linear, log, or time-lagged data, and refining the models for more accuracy is the challenge of those applying such techniques. Essentially, the process requires many observations to be loaded into a matrix and then fitted to examine the impact on “selling price” with a method that minimizes the deviations in the estimate in comparison with the actual data. There are many assumptions behind this model, but for typical residential properties with many good comparables in the data set, the estimates can be quite robust. Using geographic information systems (GIS) to select observations surrounding a subject property, size and age alone will often explain 85% of the variation in selling price. Advances in GIS techniques and more widely available data in near real time have allowed for significant advances in such models.

The principal advantage of such statistically driven AVMs for mortgage lenders is that the models are unbiased. That is, the estimates will be high

50% of the time and low 50% of the time, with a mean error near zero. This compares with human manual appraisals that are exact matches for the purchase price 50% of the time and, according to Freddie Mac, rarely under the purchase price. Loan officers seeking approvals and appraisals that will not discourage the current transaction have driven this bias in the current system. Unless qualified appraisers are selected on some basis without inherent bias, the AVMs will become the appraisal process of choice for mortgage buyers like Freddie Mac. Several competing national vendors, such as FNIS (Fidelity National Information Solutions) and Freddie Mac, provide AVM services in the residential arena.<sup>17</sup>

In the residential market, AVMs are likely to have a major impact on the demand for traditional appraisals over the next several years. In the commercial market, firms like REIS are starting to develop AVMs, but such systems remain user-driven and dependent on local information. The commercial property appraisal market will likely continue to rely on local research and expertise in applying the various techniques of the income approach to value, with increasing use of DCF as a valuation method.

**Many Other Contributors to the Appraisal Profession and Influential Universities.** Countless other contributors to the appraisal profession have provided technical refinements, educational leadership, synthesis, and examination of specific influences on property value. These include Fred Case, Kerry Vandell, Hugh Nourse, Ron Racster, Maury Seldin, Hal Smith, Alfred Ring, Harry Atkinson, Ken Lusht, Austin Jaffee, John White, Steven Messner, Stephen Roulac, Kelly Pace, and many more, most of whom have been affiliated with major universities housing real estate programs.

Before 1970, only a handful of real estate programs existed in American universities—the University of Chicago, University of Michigan, Indiana University, University of Wisconsin-Madison, and Columbia University among them. After the 1960s, many real estate programs and departments were established based on a growing demand for educated and broad-based real estate professionals. During the period from 1970 to the present, the leading real estate programs have been represented by the University of Wisconsin-Madison, Indiana University,

16. For a review of the technique, see Miller (1982) in References.

17. Other AVM techniques include repeat sales indices, such as Case-Shiller-Weiss, and updated sale prices, as well as reliance on updated assessment data.



Ohio State University, MIT, Wharton School, University of California, Berkeley, University of Georgia, University of Cincinnati, University of North Carolina at Chapel Hill, Georgia State, Southern Methodist University, Louisiana State University, University of Florida, and University of Connecticut, as well as others.<sup>18</sup>

Professional institutions and associations have played a significant role as well in the development and growth of the field. The Appraisal Institute, Homer Hoyt Institute, American Real Estate and Urban Economics Association, and American Real Estate Society are among the leading organizations that continue to contribute much to appraisal thought.

### Conclusions

In preparing this paper, we sifted through an enormous literature base and selected a small subset of influential people, technologies, and theories that have spawned and influenced the methods used in the appraisal profession from its birth in the early part of the last century to the present. We see that the changes observed in theory and methodologies did not occur in a vacuum. Each major contributor studied under or worked with other leaders in the field. It is often exceptional situations and changes in technology that foster new methods of valuation or modifications of traditional techniques. This is how the field progresses. We have also seen that appraisal methodology is not static and never has been.

The newest contributions are, of course, hard to recognize until they have passed the test of time. There exists a lag from new theory to full implementation, and as such, appraisers do not use many of the most modern academic contributions. This is true of most industries. Appraisers must stay open-minded and understand that they are never insulated from the changes in the world. Constant education and utilization of the latest technology are required more than ever to stay competitive.

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18. We apologize to the many other fine programs that should be listed in this very brief review.



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