



**TRANSPORTATION
RESEARCH
BOARD**

1920 - 1995

75 Years of Excellence...
and IOWA was there from the beginning.

Iowa and the establishment of the Highway Research Board

Certainly no one person or state was the sole impetus for something as monumental as the Highway Research Board. Yet Iowa boasts of having provided many of the key people whose vision and energies literally created and sustained the HRB during its first critical years: Anson Marston, Thomas Agg, Thomas MacDonald, and Roy Crum.

1920: a national highway crisis

From the turn of the century to 1920, the population of the United States increased by nearly 40 percent, to 106 million. During that time the number of motor vehicles caught up with the declining number of horse-drawn vehicles. By 1920, automobiles, trucks, horse-drawn carriages and wagons, motorcycles, bicycles and saddle horses shared the nation's roads with pedestrians. These conveyances traveled at different speeds and had different weight capacities, space requirements and effects on the road.

Millions of incompatible vehicles were thus traveling roads that had not recovered from the effects of World War I. In 1917-18 U.S. industry had mobilized for the war effort, overburdening the nation's rail capacity and precipitating the production of large numbers of motor

trucks to fill the gap. Hauling record per-vehicle loads of up to 12 tons gross at speeds up to 20 miles an hour, wartime truck traffic reached its peak during the spring thaw of 1918. The nation's primitive but fairly adequate system of roads of gravel, brick, wood, macadam or concrete literally fell apart under the burden.

In addition to their deplorable post-war condition, 1920's roads were narrow and filled with blind curves. Stop signs, signals and lighting were practically unheard of. Motor vehicle drivers were unlicensed and untrained.

Establishment of the Highway Research Board

Recognizing a national crisis concerning roads, the federal government apportioned \$200 million in 1919 to state highways, adding this amount to unspent funds from the first Federal Aid Road Act of 1916. Adequate funds were now available, but highway needs were new, uncharted and immediate. How were highway agencies to spend these funds effectively and

efficiently to meet the country's changing transportation needs?

Several organizations were poised to help.

- In 1912 the Bureau of Public Roads (BPR), which was part of USDA, had established a nucleus of scientists and engineers for highway research (mostly materials and construction). By 1920 the BPR was the most experienced highway research organization in the U.S., with Iowa's Thomas MacDonald as its chief.

- In 1917, the American Association of State Highway Officials (AASHO) had established its Committee on Tests and Investigations, with Thomas R. Agg from Iowa State College (today's Iowa State University of Science and Technology) and the Iowa State Highway Commission at its helm.

- Several state highway agencies had begun at least limited research programs.

- Universities were developing transportation research facilities. For ex-

1904

Iowa takes 1st steps toward national prominence in transportation research:

- Iowa State Highway Commission created as part of Iowa State College
- Marston becomes first dean of engineering at Iowa State College
- Iowa State Engineering Experiment Station established

1899

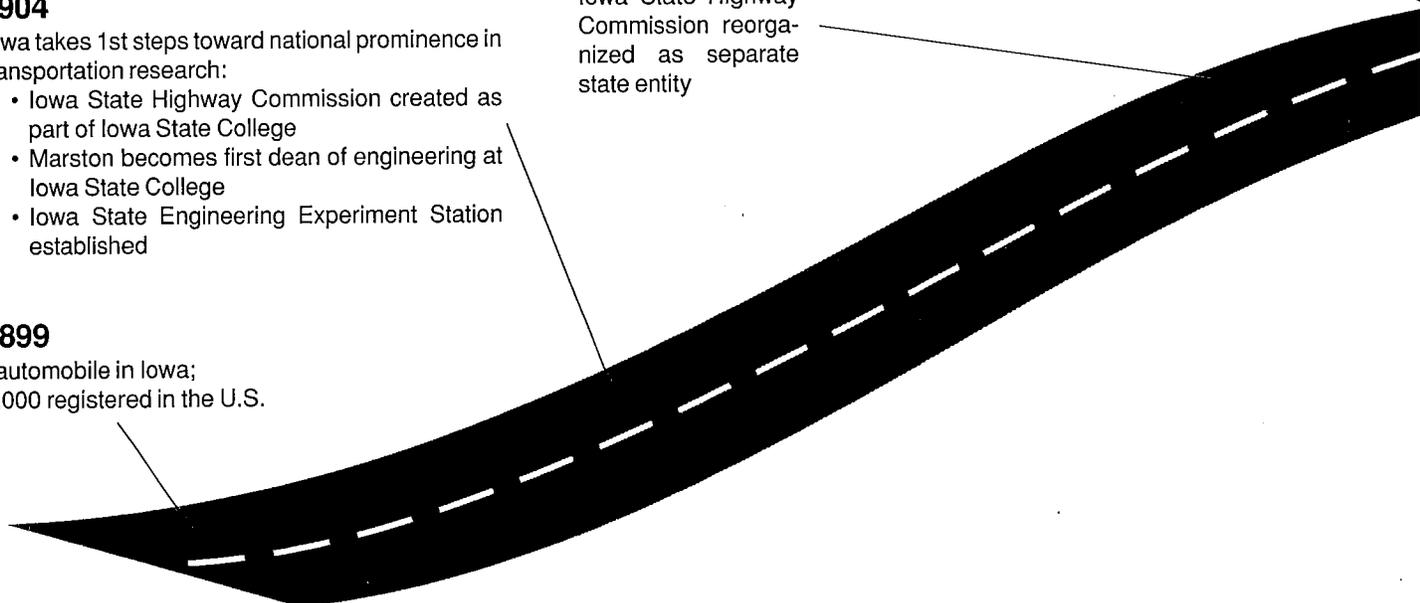
1 automobile in Iowa;
8,000 registered in the U.S.

1913

Iowa State Highway Commission reorganized as separate state entity

1917-18

U.S. involvement in WWI;
disintegration of highways



ample, Iowa State College had its Engineering Experiment Station. Researchers like Anson Marston and Agg (and later Roy Crum and Ralph Moyer) were making contributions of national significance to the transportation industry.

With so many diverse agencies interested in highway research, and with millions of federal dollars available for highway construction, many individuals recognized the need for a nationally coordinated program of highway research. Without such a program, research would be fragmented and needlessly duplicated, and highway agencies would build roads without the benefit of research results. Marston of Iowa led the call for such a coordinated program, with Agg and MacDonald echoing the message.

Fortunately, the mechanism for such a coordinated program already existed in

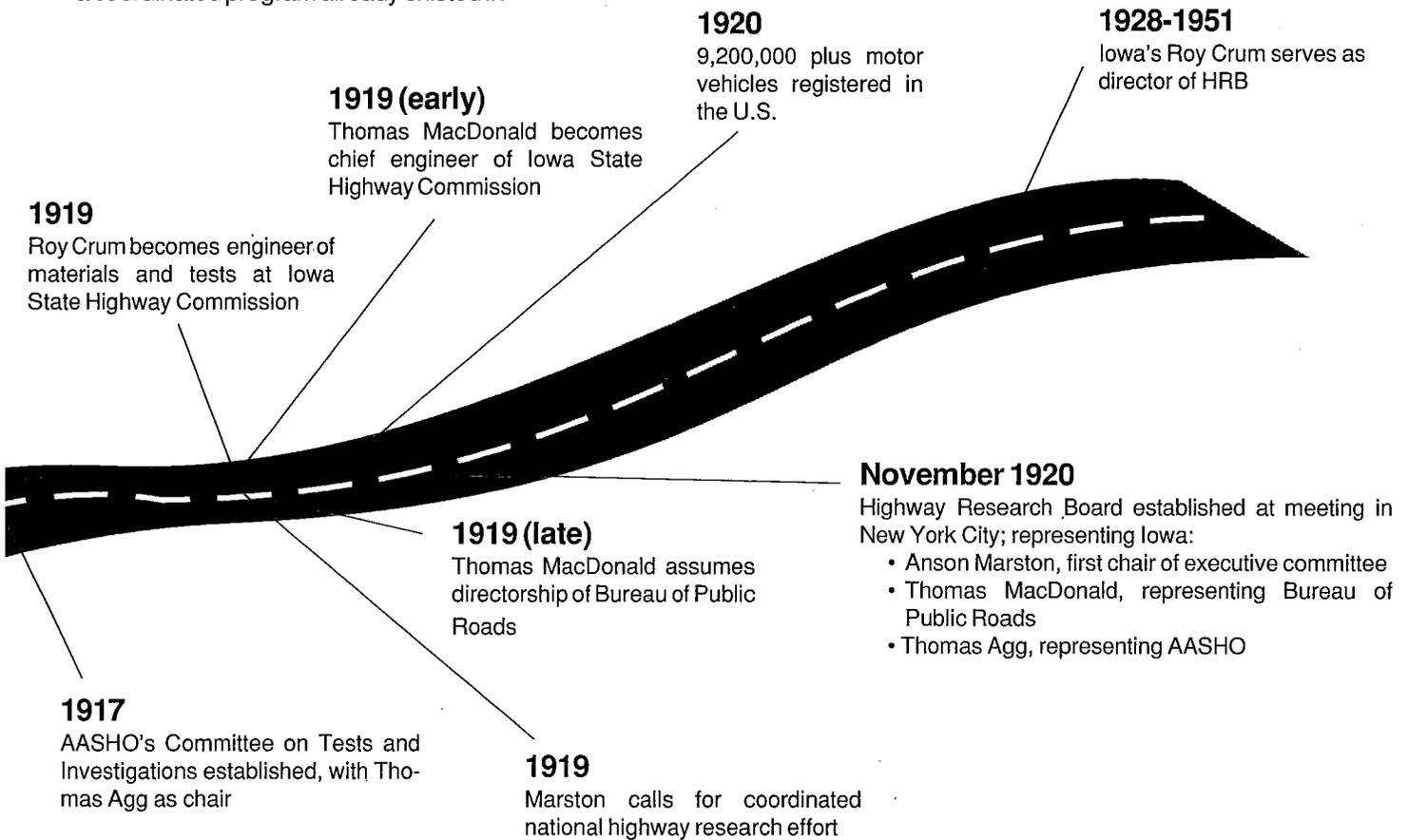
the National Research Council's Division of Engineering. A nongovernmental agency, NRC coordinated mathematical, physical and biological scientific research that contributed to the national welfare.

Initial organizing conferences of highway-related agencies were held in 1917 and 1919. In November 1920, representatives of these interested organizations met in New York City to establish the National Advisory Board on Highway Research within the NRC's Division of Engineering—later to become the Highway Research Board (HRB).

At that critical juncture, several Iowans led the way. Marston, dean of engineering at Iowa State College, chaired the HRB's first executive committee. MacDonald, former chief engineer of the Iowa State Highway

Commission and chief of the Bureau of Public Roads, put the BPR's resources at the disposal of the HRB until his retirement in 1953. Agg, testing engineer at the Iowa State Highway Commission and a representative of AASHO, also served on the board for several years. In 1927 Roy Crum left his research at the Iowa State Highway Commission to head the HRB until his death in 1951.

In 1974 the HRB changed its name to the Transportation Research Board, reflecting a commitment to expand its research activities beyond highway systems to intermodal transportation systems. This commitment continues today.



The Grand Old Man of Engineering at Iowa State

When Iowa had fewer than 25 miles of concrete highway and the idea of a national highway system was only a dream, Anson Marston was the mainstay of a movement for a national, coordinated program of highway research. In 1919, at the annual meeting of the American Association of State Highway Officials (AASHO), Marston issued a call for such a program. Due largely to Marston's progressive vision and tireless efforts, the National Advisory Board on Highway Research (later the Highway Research Board) was established in November 1920; Marston chaired the board's first executive committee.

The HRB was not the first of Marston's achievements to profoundly affect the transportation industry. The first dean of engineering at Iowa State College, Marston led the drive to establish the Iowa State Highway Commission in 1904—the mechanism that not only pulled the “mud state” out of the muck but went on to build one



of the finest and best maintained state road systems in the nation. Marston served as a commissioner during the agency's first 23 years.

Recognizing that road systems must be not only intrastate but interstate, Dean Marston set aside his dislike of centralized government control and supported the establishment of the Bureau of Public Roads within the U.S.

“The results are to be taken right off the griddle, as it were, as the meal proceeds.”

When responding to a question about the proposed research board's ability to produce timely results.

Department of Agriculture. True to Marston's vision, the BPR operated in partnership with the states to develop a uniform, standard and coordinated system of federally funded roads throughout the country.

Dean Marston also established the state-supported Iowa Engineering Experiment Station at Iowa State College, a pioneer research and testing station that performed some of the first modern transportation-related research and published its findings in a series of bulletins.

Not least of all, Dean Marston was teacher, mentor and/or professional associate of other leaders from Iowa in the field of transportation engineering and research: Roy W. Crum, Thomas H. MacDonald and Thomas R. Agg.



Iowa Engineering Experiment Station's laboratory for testing road and pavement materials, circa 1915.

Thomas H. MacDonald

Father of modern highway engineering

Ranked among "the best and greatest engineers in the United States" by his professor and mentor, Anson Marston, Thomas MacDonald was--along with Marston--the catalyst for the founding of the Highway Research Board.

In 1919 MacDonald was the chief engineer of the Iowa State Highway Commission, one of the most respected highway departments in the country. Upon the death of Andrew Page, MacDonald relinquished his state post to take over as chief of the Bureau of Public Roads, a position he held for 34 years. During those years MacDonald oversaw the transformation of the nation's roads from a post-World War I quagmire to one of the most modern and extensive systems in the world.

MacDonald also crusaded for a national program of highway research. Having succeeded, he served on the first executive committee of the Highway Research Board and was a member

"The highway engineer has for the first time had placed in his hands large sums for highway improvement. . . . The expenditure of a reasonable proportion of these funds for highway research and experimental studies will be the best investment that can possibly be made."

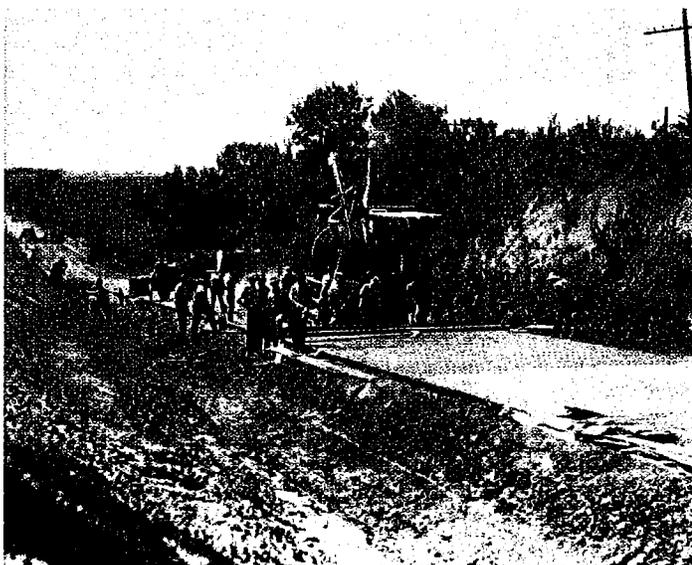
Speaking to the organizational meeting of the Highway Research Board in November 1920.

and driving force of the HRB until his retirement from the BPR in 1953. MacDonald used the BPR's resources to support the fledgling HRB during its first lean years, and continued financial support and other assistance until the state highway departments began supporting the HRB.

Today's Transportation Research Board still carries the imprint of this Iowan. For example,



MacDonald firmly believed in decentralization, and in what we now call "partnering" or "cooperative research." Under his leadership the BPR entered into joint research programs with state highway departments and universities, and the HRB encouraged similar partnerships.



Thomas R. Agg

Iowa's AASHO representative to HRB

Iowa's Thomas R. Agg was one of the "prime prodders" behind the drive for a national program of highway research. Agg was a professor at Iowa State College and a testing engineer at the Iowa State Highway Commission in 1919 when he issued a formal call in *Public Roads* for a comprehensive research program to investigate highway construction materials and methods.

Agg's appeal was prompted by his work as the chair of AASHO's Committee on Tests and Investigations, begun in 1917. With trucks and automobiles making a shambles of macadam road surfaces that once easily supported horse-drawn conveyances, roads were falling apart faster than they could be built. Testing information regarding materials and construction techniques was sorely needed, and the AASHO committee concluded iso-



lated studies wouldn't help unless they were coordinated and a system developed to disseminate results.

Agg represented AASHO at the

What is needed is a "far sighted, comprehensive program of investigation of materials and methods of construction now employed in highway improvement."

(Public Roads, August 1919)

organizational meeting of the Highway Research Board in November 1920; chaired the HRB executive committee in 1927; and chaired its committee on economic theory of highway improvements from 1919 to 1929. In 1932 he succeeded Anson Marston as dean of engineering at ISC, and in 1936 he received the HRB's George S. Bartlett Award for outstanding contributions to highway progress.



Roy W. Crum

The Highway Research Board's “idea man” from Iowa

During Roy Crum's 23 years as director of the Highway Research Board, the HRB developed the basic organization and emphasis on state partnerships that continue today.

A 1907 graduate of Dean Marston's engineering program at Iowa State College, Crum was a professor at Iowa State working with the Iowa Engineering Experiment Station in 1919 when he became engineer of materials and tests for the Iowa State Highway Commission. There he earned a national reputation for his research in materials and highway construction, as well as the attention of the HRB; he was tapped for its directorship in 1928.

Among his countless accomplishments as HRB director, Crum:

- encouraged early cooperative projects like the HRB-AASHO roadside development project and the highway research census in

“The end product of our work is usable technical information, but it will be of no value to anyone unless it is learned and put to use by the technical man.”

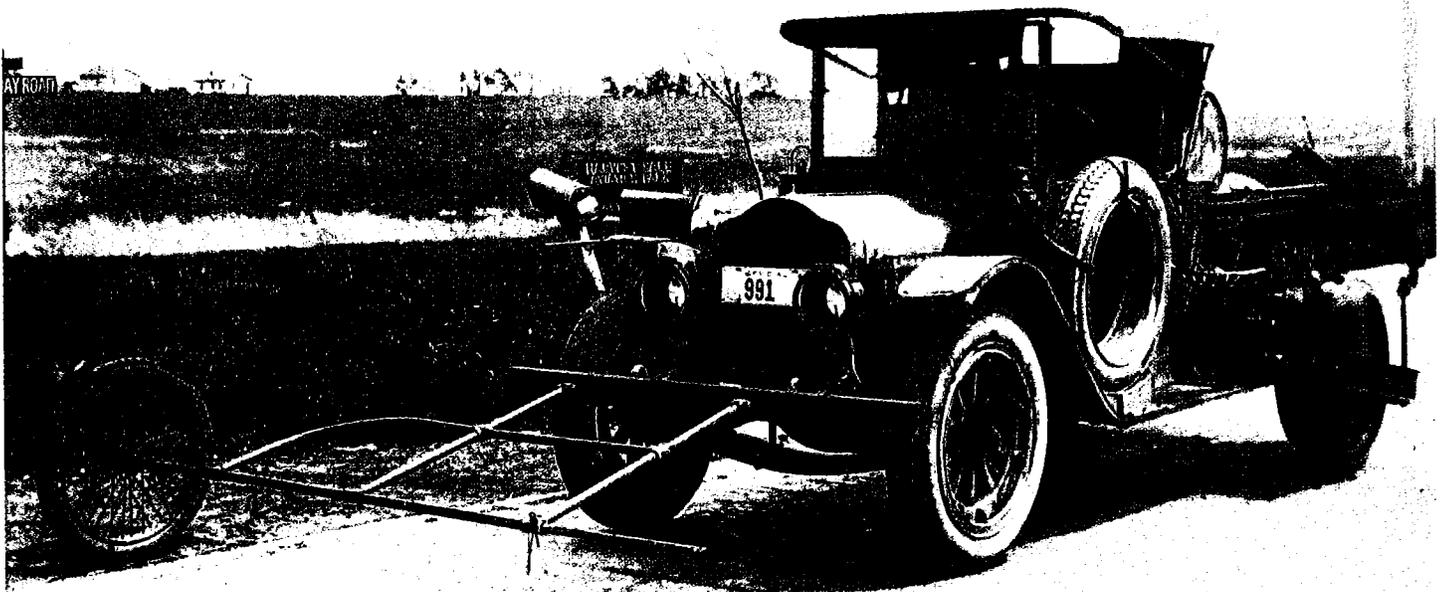
the 1930s, setting the stage for countless partnership projects with the states;

- pushed for the establishment of the Highway Research Information Service (HRIS);

- began the Highway Research Correlation Service (RCS) in 1945; and

- responded to World War II's immediate transportation problems by publishing wartime bulletins which, after the war, evolved into the “Current Road Problems” series.

Until his death in 1951, Crum focused his energies on the HRB's central mission: identify the nation's most pressing transportation research needs, coordinate research efforts, reduce duplication, and disseminate findings efficiently.





1920 - 1995

75 Years of Excellence...

and IOWA was there from the beginning.

The following list is only a sampling of the thousands of revolutionary discoveries and breakthroughs in transportation research in which the Transportation Research Board has played a significant role in the last 75 years:

- bituminous and portland cement concrete pavements
- soil stabilization
- smooth, skid-resistant surfaces
- air entrainment
- controlled-access highways
- divided highways and one-way systems
- network signalization
- highway capacity determinations
- land-use traffic generation and traffic assignment
- socioeconomic analysis in highway location
- dynamics of traffic flow
- energy-systems concept in research

In the last 25 years the TRB has, in particular:

- expanded its focus to cover all transportation modes;
- studied critical national transportation policy issues like school bus safety, truck size and weight issues, effects of airline deregulation, high-speed rail, and congestion pricing;
- conducted a series of strategic transportation research studies that resulted in the establishment of the Strategic Highway Research Program and the Transit Cooperative Research Program; and
- established the National Cooperative Highway Research Program (NCHRP) and Innovations Deserving Exploratory Analysis (IDEA) Programs.



TRANSPORTATION RESEARCH BOARD

The Iowa Department of Transportation,
the Department of Civil and Construction Engineering, and
the Iowa Transportation Center at Iowa State University

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Parks Library Archives at Iowa State University, and the Iowa Department of Transportation