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THE AMERICAN ROCKET SOCIETY STORY — 1930-1962

FRANK H. WINTER*

1. INTRODUCTION

Half a century ago, on 4 April 1930, eleven men and one woman gathered in the third floor apartment of a small brownstone apartment at 450 West 22nd Street in New York City and formed the American Interplanetary Society, later known as the American Rocket Society. The name and purpose of the organization – to promote interest in and experimentation "toward interplanetary expeditions and travel" – was highly incongruous just six months after the stock market crash and the beginning of a prolonged depression upon the country. These people were indeed naive to think that the technology, let alone the finances for such ventures, were matter-of-factly close at hand. Yet these were idealistic dreamers of the same sort who had started the German Society for Space Travel three years previously, in 1927, and the same kind who were to begin the British Interplanetary Society three years later, in 1933.† Like their future British counterparts, in fact, the majority of the founders were science fiction writers or enthusiasts. The group consisted of Mr.and Mrs. G. Edward Pendray, in whose apartment the group met, David Lasser, Charles P. Mason, Charles W. Van Devander, Fletcher Pratt, Nathan Schachner, Laurence E. Manning, William Lemkin, Warren Fitzgerald, Adolph L. Fierst and Everett Long. The Pendrays were both journalists. G. Edward was a reporter and soon the science editor for the *New York Herald Tribune* but also contributed to Hugo Gernsback's *Science Wonder Stories* under the *nom de plume* of Gawain Edwards. Mrs. Pendray wrote a widely syndicated series of women's columns under several *nom de plumes* but was known to the Society under her maiden name of Leatrice or Lee Gregory. David Lasser, who was actually principal organizer of the Society and elected its first president, was managing editor of *Wonder Stories*. Mason was associate editor of the magazine and also wrote science fiction. Van Devander was another journalist who wrote science fiction on the side, under the name of "Peter Arnold." Pratt was a prolific author of both science fiction stories and American history, including a biography of Thomas Jefferson. Schachner, a lawyer by profession, was well known to *Wonder Stories* readers as "Nat Schachner." Canadian-born Laurence Manning, was manager of the Kelsey Nursery but was likewise a popular contributor to *Wonder Stories*. Russian-born William Lemkin was the only Ph. D. present. He taught chemistry at New York's High School of Commerce and also authored both chemistry and science fiction pieces for *Wonder Stories*. Fitzgerald was reportedly a light skinned black man and the only known representative of his race to actively participate in the then new endeavour of science fiction fan club or "fandom." (Fitzgerald was president of the New York science fiction club known as The Scienceers, this organization having been mentioned serveral times in the correspondence section of Gernback's *Wonder Stories*). Unfortunately, nothing is known about Everett Long except that he too was an avid fan of both science fiction and the concept of interplanetary flight. In those years science fiction and the space travel movement went hand-in-glove.

Ten of the twelve founding members of the American Interplanetary Society. Not shown are Warren Fitzgerald and Everett Long. David Lasser was the Society's first President; G. Edward Pendray the Vice-President; Charles P. Mason was the Secretary; Fletcher Pratt, the Librarian and Van Devander, the first editor of the *Bulletin of the American Interplanetary Society*. Mrs. Pendray later served as the Society's first official photographer.

Unquestionably, the founders of the American Interplanetary Society were inspired by their own and others' tales of flights to other worlds rather than upon any technical foundation. In brief, they were romanticists, not engineers. Although Lasser held a Batchelor of Science degree from the prestigious Massachusetts Institute of

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† For the German Rocket Society story see *Spaceflight*, **19**, Nos. 7-8, July-Aug. 1977, pp. 243-256.

Technology and Lemkin, as we saw, had a doctorate in chemistry, G. Edward Pendray wrote about science for popular consumption and was largely self-taught in the technical fields. It is no wonder that there was no "blueprint" laid out for technical prosecution of interplanetary flight, but there was a dynamic, and in its own way, ingenious propaganda campaign to attract new members and otherwise promote the cause of space flight.

This is not to say that the Society did not seek out technical information, what there was of it in those years. A letter was written to the Army's Office of the Chief of Ordnance, for example, requesting any available data on rockets. In their reply of 15 November 1930, the Ordnance Department could only inform them that "this department has not conducted experiments with long range rockets" and that "based upon information contained in the daily press from time to time.... it appears that Professor Albert [sic] Goddard, of Clark University has conducted more research on this subject than have the military services." "Albert" Goddard was really Robert H. Goddard, of course, but in any event correspondence with him also proved negative. Goddard preferred to work alone. "In your letter of the fifteenth (of November 1930) concerning the question of fuel for rockets," he told the chemist Dr. Lemkin, "I regret that I must still explain, as I did to Mr. Lasser last August, that I do not yet feel that my work is sufficiently complete for a presentation on the subject. I wish, however, to thank you very much for your enquiry, and to assure you that I shall follow the developments of your Society with interest."

2. FIRST PUBLIC MEETING

If progress on the technical front was nil, then promotion-wise the Society was more successful, although Lasser resorted to a little subterfuge. Lasser went to a rare book dealer and purchased a copy of *The Discovery of a New World, or a Discourse Tending to Prove That There May Be Another Habitable World in the Moon,* written in 1640 by the English cleric Bishop John Wilkins of Chester. Lasser then arranged with one of the astronomy editors of *Science Wonder Stories*, Dr. Clyde Fisher of New York's American Museum of Natural History, to utilize the Museum's auditorium for the Society's first public meeting in which the press were also invited. At this meeting, held 30 April 1930, the noted polar explorer Captain Sir Hubert Wilkins, a distant descendant of Bishop Wilkins, "officially donated" the book of his ancestor to the Society. The staged "event," at least, created some immediate publicity for the Society. The Society's mimeographed journal, *The Bulletin of the American Interplanetary Society*, made its first appearance in June of that year and was a more positive way of both attracting new members as well as presenting new ideas about space flight. Members could also be informed of the latest developments in rocketry – though no technical details were available from Goddard. Typical items included a death notice of the Austrian rocketry pioneer Max Valier and the mail rocket experiments of the Czech inventor Ludvil Ocenasek.

Lasser, and particularly Pendray, also publicized the Society and its lofty aims in newspapers and magazines. From the 1930's these articles, often appearing as splashy Sunday supplement features, eventually did get through and make the populace, if not the scientific world, "space conscious." For the moment, this was a greater service than any technical accomplishments as the possibility of space travel was at first regarded with considerable skepticism. Writing in the editorial page of *New York Evening Post* for 19 July 1930, Lasser noted that "the public attitude, judging from those I meet in my daily contacts, is that of incredulousness, mixed with a broad dash of pity, toward those who seriously think that man can escape from the chains that bind him to Earth. The public, especially the unscientific majority, still looks with horror at the spectacle of vast distances to be traversed and tremendous speeds to be attained on the journey to one of our celestial neighbours." P. E. Cleator and other early members of the British Interplanetary Society were to face the same level of criticism across the Atlantic, three years later. The scientific community of the time was even more intolerant towards the fledging space travel movement – and rightly so, because of the movement's generally unscientific approach and because of the paucity of meaningful data, or real experiments. Space travel was also "unrespectable," being categorized, perhaps, as a fringe or pseudo-science. There was ignorance, too, on the parts of both the public and the scientists. The most common notion which negated the feasibility of space flight was that the rocket needed air to "push against," hence, would not work in the vacuum of space. Goddard faced the same sort of rubbish in 1920 when his *Methods of Reaching Extreme Altitudes* was first released. Ten years later, Lasser and his American Interplanetary Society confronted the same Medieval dogma. Lasser, in a letter to the *New York Evening Post* of 7 August 1930, had to patiently explain the fundamentals of rocket motion based upon Newton's Third Law of Motion in answer to one "Earthbound" who was convinced that the rocket had no chance at all of leaving the atmosphere. Perhaps, in retrospect, the space flight movement of the 1930's needed more publicists or public relations men than scientists. (Lasser eventually wrote the first book on Astronautics in the English language, *The Conquest of Space,* released in late September, 1931).

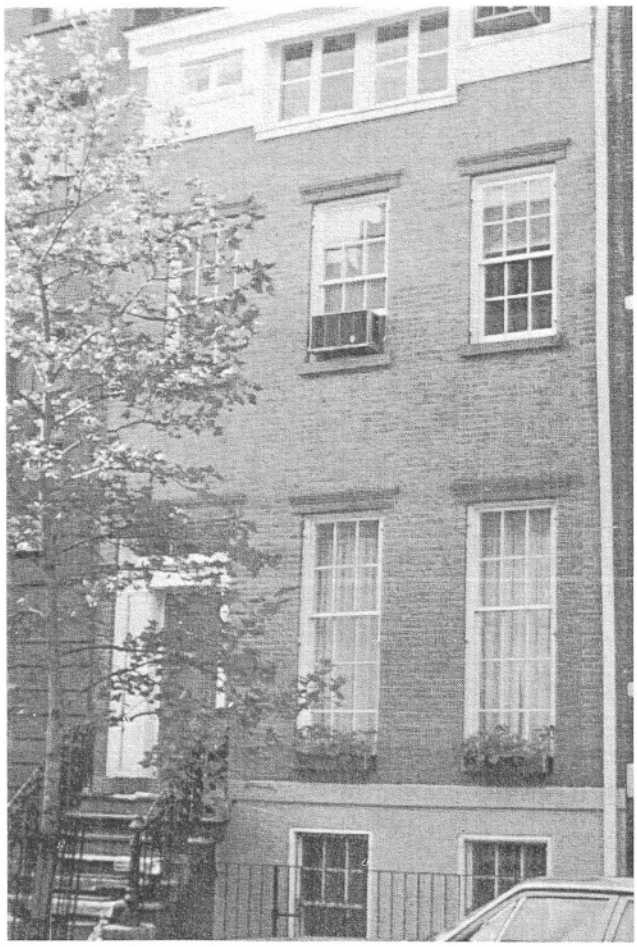
3. ROLE OF MOTION PICTURES

Movies have always been an ideal medium to instantly convey messages and fortuitously one such film existed in 1930. This was Fritz Lang's "Frau in Mond" ("Woman on the Moon"), of 1929, Germany's last big silent before the "talkies." Hermann Oberth, foremost of the European space travel theorists, had been the technical director. Apart from Lang's insistence that his space heroes discover air on the Moon by lighting a match, so that the actors would not have to play the lunar scenes all covered up with diving suits, the spaceship and its operation looked more or less credible.* Lasser hired the English-titled version of the movie, called "By Rocket to the Moon," and arranged a well publicized programme in the American Museum of Natural History. Placards were printed and posted throughout New York City's perenially busy subways, advertising that "By Rocket to the Moon" would not only be shown free but that France's great aeronautical and astronautical pioneer would be there to present it. Esnault-Pelterie was coming to America to prosecute his 2.5 million dollar lawsuit against the U.S. Government for infringing upon his airplane "joystick" patent, a lawsuit he ultimately won. The Frenchman could also not pass up the opportunity to accept Lasser's request to help promote the "cause" of space flight. The programme was set for 8:30 p.m., 27 January 1931.

Almost at the last minute, Esnault-Pelterie made it known that he was not able to speak because of a cold.

* The author selected and presented "Frau im Mond" in a Space Science Fiction Series of the National Air and Space Museum, Washington, D.C., during January, 1980, with a good and enthusiastic turnout, showing that the film still has impact even though the storyline is insipid and the "science" a bit "quaint" and naive.

G. Edward Pendray, the Vice-President of the Society, was elected to substitute for the Frenchman. The substitution was clearly announced. Yet after the movie many in the jam-packed auditorium came up to the stage clamouring for Esnault-Pelterie's autograph. As Pendray explained many years later, "After several fruitless efforts to explain that I wasn't the great Frenchman in person, I gave up and signed Esnault-Pelterie's name right and left. As a result of that night's work there are hundreds of copies of Esnault-Pelterie's signature in autograph collections today that couldn't be phonier.



Site of the founding of the American Interplanetary Society (later, the American Rocket Society), 450 W. 22nd Street, New York. (Society founded 4 April 1930).

4. A TRIP TO EUROPE

A couple of months after this unforgetable incident, Mr. and Mrs. Pendray took a two-week European vacation which turned out to be the start of the Society's experimental period. The Pendrays were to combine business and pleasure in that they were the unpaid official "representative" of the Society in an attempt to meet all the leading rocketry experimenters and space travel authorities on their trip they could. They sailed aboard the *Ile de France* from New York on 20 March 1931, a few days later arriving at their first stop, Naples. Inquiries were made to locate one Dr. Darwin Lyon. Lyon was an American making a fantastic claim of having recently shot up a two-stage liquid propellant rocket from atop the Italian Alps to a height of 70 to 90 miles (112-145 km). It is immaterial that Lyon was a fraud as the Pendrays were unable to contact him anyway. From Naples the *Ile de France* cruised to Marseilles. Here the couple transferred to a train which too took them to Paris. Robert Esnault-Pelterie had returned to France (also by the *Ile de France*) by this time and the Pendrays wished to renew their friendship. Esnault-Pelterie was not available, however. From Paris the Pendrays went to Berlin and here their rocket mission proved successful. They met Willy Ley, the young Vice-President of the German Rocket Society (the VfR), who like many of the members of the American Interplanetary Society, was also an avid science fiction enthusiast and himself an active writer. Despite Ley's poor English he was a gracious host and on 21 April took the couple to the German Rocket Society's Raketenflugplatz testing facility on a disused German Army ammunition dump in a Berlin suburb. The Pendrays were introduced to Rudolf Nebel, Klaus Riedel and other key members of the VfR and were shown everything. But the most memorable moment for the Pendrays was when they witnessed firings of Repulsor rockets – the first working liquid-fuel rockets they or any of the members of the American Interplanetary Society had ever seen. "They were small," Pendray later recalled, "five or six inches high (13-15 cm) with gasoline-liquid oxygen powered motors the size of a hen's egg. They were crude – spun aluminium in a can of water (i.e. a water-cooled jacket). But they worked! Until that moment I have never quite been able to visualize how a spaceship would fly." Ley was more than obliging in rendering sketches of the basic schematics of all the German motors up to that date, including the first VfR Miraks, or Minimum Rockets. Upon their return to New York, G. Edward-Pendray wrote up a detailed account of the trip and of the construction of the rockets which was duly published in the May and subsequent issues of the *Bulletin of the American Interplanetary Society*. Pendray also presented his findings in the 1 May 1931 meeting of the Society. He credits new member Hugh Franklin Pierce, at that time a ticket-seller with the New York subways, with proposing that the Society itself start experimenting. An experimental Committee was formed with Pendray as Chairman. Pendray and Pierce designed the first rocket which was based upon the German Two-Stick Repulsor. Thus, the American Interplanetary Society had embarked upon its own rocketry programme by a curious technological transfer – not through Goddard nor another American but *via* a pleasure cruise to Germany.

5. FIRST ROCKET EXPERIMENTS

Ohio-born Pierce was a natural mechanic. He largely built the rocket himself with his own tools in the basement of his Bronx apartment. As with the German pattern, the rocket's fuel (gasoline) was fed into the combustion chamber by nitrogen pressure while the liquid oxygen entered by partial evaporation. The German nose-dive configuration was also followed in which the rocket engine was mounted in the forward section rather than in the aft as is the design of all modern rockets. The exhaust was expelled in the open area between the thin fuel and oxidizer tanks which also served as a framework. The rocket therefore did not have any shroud aluminium fins at the base. Cost-wise, the rocket was a marvel: $30.60! This was due to features like the free cast aluminium rocket motor which was supplied by the Aluminium Company of America; the aluminium water-jacket which was a shaker cup given away as a premium by a chocolate milk company; the parachute holder made of a saucepan; and the parachute of silk pongee purchased by Mrs. Pendray at a department store and sewn by her at home. In addition, the Schrader Tire Valve

Mrs. Pendray, left, was the Society's official photographer in some of their early tests such as the first one at a farm near Stockton, New Jersey, on 12 November 1932. Note the firing board to the right of Mrs. Pendray. Her husband is in the overalls, back to camera, and steadying the rocket.

Company supplied pressure valves, gratis and George V. Slottman* of the Air Reduction Company provided – and continued to provide – free liquid oxygen and liquid oxygen handling equipment at cut rate prices. One problem remained – where to fire the rocket. Dr. Lemkin was the Society's chauffeur in scouring the New York and New Jersey countryside. Eventually, Lasser's uncle's farm near Stockton, was selected.†

At the 18 February 1932 meeting of the Society Pendray brought the rocket with him and, with Pierce, demonstrated how it worked. "The small rocket we show tonight," Pendray waxed proudly, "is a start in the direction of interplanetary flight.... Membership (of the Society) costs almost nothing – $3 to $10 a year. A thousand members will permit us to continue these experiments until they are placed upon a practical basis. The future, not only of the Society but its experimental programme is in your hands." Pendray's optimism was indeed high. In 1932 membership of the American Interplanetary Society amounted to only 114 and was not to reach the 1,000 mark until 1949-1950 when the organization was then known as the American Rocket Society. As for interplanetary flight, this single-minded goal was also achieved but did not start with what is known as ARS Rocket No. 1. In fact, the four rockets constructed between 1932 and 1934 by the Society for flight purposes did not yield any significant technological breakthroughs. Rather, that period was a learning process in the fundamentals of rocketry and leading to the far more significant period of testing motors and their performances on stationary stands. Nevertheless, the overall results of the flight rocket period is summarized in the following chart:

* George V. Slottman died in April 1958. Pendray expressed deep sorrow to Mrs. Slottman and said that his assistance, advice on how to use liquid oxygen and friendly interest; gave inspiration and guidance to the Society. Slottman joined the Society and later became one of its directors. The cost breakdown of the rocket is given by Pendray's article "Why Not Shoot Rockets?" in *JBIS*, 2, Oct. 1935, pp. 9-12.

† Interestingly, the German Rocket Society's first rocket was similarly tested on the farm of one of the member's uncles, in this case Klaus Riedel.

American Interplanetary Society (American Rocket Society) Flight Rocket Experiments, 1932-34.

American Interplanetary Society (American Rocket Society) Flight Rocket Experiments, 1932-34.

Rocket	Designer(s)	Date Flown or Tested	Location	Performance	Dimensions
ARS No. 1 (Technically should be called AIS No. 1)*	G. Edward Pendray and Hugh F. Pierce patterned after German Two-Stick Repulsor.	12 November 1932	Farm, near Stockton New Jersey.	Not flown; burned satisfactorily 20-30 sec. per 60 lbf (27 kgf)	Overall 7 ft (20 cm); weight 15 lb. (6.8 kgf)
ARS No. 2 (Technically should be AIS No. 2)	Bernard Smith; made from tanks and motor of ARS No. 1	14 May 1933	Great Kills, Staten Island, New York.	250 ft. (76 m) altitude per 2 sec.; thrust, about 60 lbf (27 kgf).	6 ft (1.8 m); weight loaded 15-18 lb (6.8-8 kg).
ARS No. 3 (Technically should be ARS No. 1)	G. Edward Pendray and Bernard Smith	9 September 1934	Marine Park, Staten Island, N.Y.	Not flown	4 ft (1.2 m); overall diam. 8 in (20cm); diam. long tanks 6.5 in (16.5 cm)
ARS No. 4 (Technically should be ARS No. 2)	John Shesta, Laurence Manning Carl Ahrens and Alfred Best; made by Shesta	10 June 1934 9 September 1934	Marine Park, Staten Island, N.Y.	Non-flight test; Flight: landed 1338 ft (407 m), 1000 ft/s (304 m/s)	90 in (2.3 m) tall; motor about 5 in (12.7 cm) diam.
ARS No. 5 (Technically should be ARS No. 3)	Hugh F.Pierce, Nathan Carver and Nathan Schachner			Project Abandoned	

* Based on name change of Society to American Rocket Society on 6 April 1934.

From this chart it can be seen that during the first experimental period an important change took place: the name change from American Interplanetary Society to the American Rocket Society (ARS). This occurred at the fourth annual meeting held at the American Museum of Natural History on 6 April 1934. The rationale was that "interplanetary" was felt not scientific enough and that it "repelled" many who would otherwise join. The resolution made it clear, however, that the change did not imply "that we have abandoned the interplanetary idea." But to many, including P. E. Cleator of the newly formed British Interplanetary Society, the new name *did* seem to indicate a change of course. It seemed all the more so because of the American preoccupation with rocket hardware rather than space travel ideas. Years later, in a letter of 13 June 1961, Pendray wrote to his friend Cleator and set the matter in its proper perspective. "We changed the name of the Society," Pendray explained, "because we judged it would lead to faster progress if we were to emphasize the means to the end (the rocket) rather than the end itself, which seemed – after our first rocket experiences – to be a long, long distance away as yet. We hoped the name change would draw into the organization a number of more practical-minded young engineers, as compared with the theorists and talkers to whom the interplanetary idea principally appealed in the early 30's.... The experience with ARS rockets No. 1 and 2 rapidly convinced us that an enormous gap existed between the then state of the rocket art and voyages in space. (But) The interplanetary idea was always the driving force of the Society..."

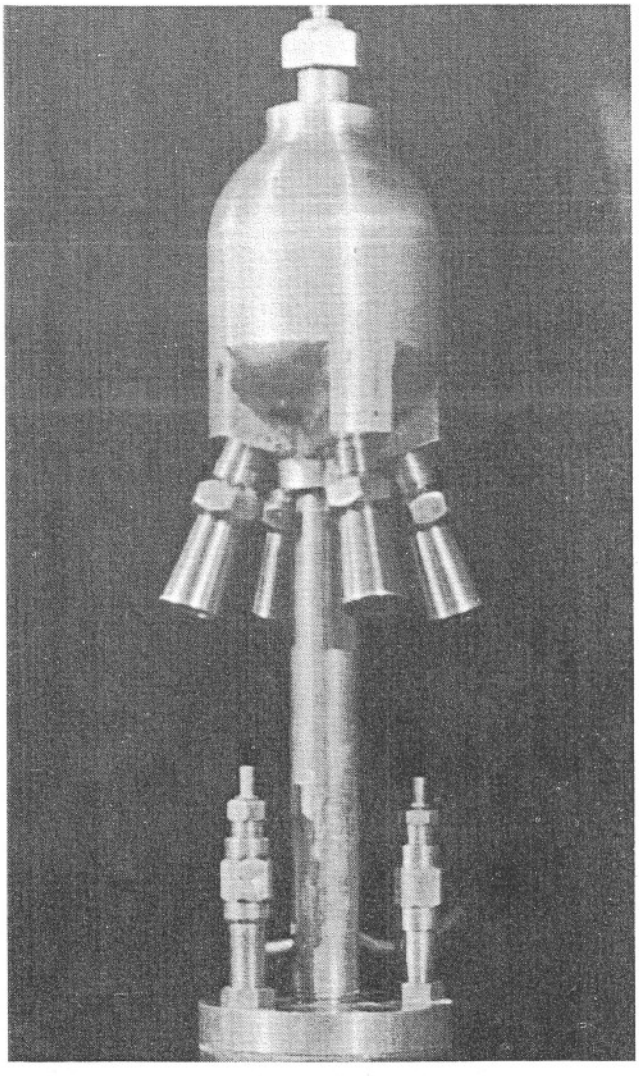
6. THE JOURNAL 'ASTRONAUTICS'

Earlier changes included the printing of the formerly mimeographed Society journal and the adoption of its new name from *Bulletin of the American Interplanetary Society* to *Astronautics*. Both these switches were made in May, 1932, though the Great Depression necessitated reverting back to mimeographing a year later. Printing was resumed from June 1935 and stayed. On the personnel side, David Lasser departed the Society in 1933. He had become chairman of the workers Unemployed Union of New York out of his concern with the effects of the Depression. He thereafter made a full-time career as a labour union official. Meanwhile, the rationale of altering the name of the Society was working: from about 1934 to 1935 an influx of "more practical-minded young engineers" indeed took place. Men like Russian-born John Shesta who had obtained a civil engineering degree from Columbia University became a member and made notable technical contributions. Alfred Africano, another new and important member, obtained a degree in Mechanical Engineering from Stevens Institute of Technology, Hoboken, New Jersey. Other new, key members were men like Bernard Smith, a sporadically employed handiman who acquired a degree in physics at Reed College, Oregon, in 1948 when he was 38; Smith who designed and built the second and third rockets of the Society, later became the Technical Director of the Naval Weapons Lab, Dahlgren, Virginia.

These men all realised that the more scientific and practical way to perfect a viable rocket motor was by carefully monitoring results on a test stand. John Shesta built the stand which measured chamber and fuel pressures, thrusts (up to 100 lbf, or 45 kgf), and times of runs. A motion picture camera and thrust/time diagrams also enabled results to be permanently recorded. The first series of runs was made in a lot adjacent to Pendray's home at Cleveland, New York, on 21 April 1935. In 1935 alone five series of experiments were made, each series averaging five motors. Amongst the criteria examined were the differences between various expansion ratios of nozzles; characteristics of various chamber pressures upon engine performances; the heat resisting qualities of different nozzle materials such as aluminium and nichrome; new materials for motors such as carbon steel; the relative differences between ethyl alcohol, Pentane, and Heptane as rocket fuels; the effect of injecting fuels towards the back of combustion chamber instead of toward the nozzle; the efficiency of alcohol fuel diluted with varying proportions of water; determining the best ratios of combustion chamber lengths in relation to diameters; and the efficiency of a water-jacketed motor made of spun aluminium. Of course, the overall primary objective was to seek the most efficient rocket motor, especially one which would not overheat over long durations.

7. LESSONS OF FIRST ROCKET TRIALS

A great deal was learned from these trials. Because of them the ARS sometimes also got into a bit of hot water. At one time exaggerated reports in the newspapers about their "moon rockets" aroused alarmed neighbours to contact the authorities to seek a ton of TNT the ARS was supposedly using. Detectives from the Yonkers Bureau of Combustibles



Engine of the ARS rocket which, launched on 9 September 1934, reached several hundred feet.

Andrew G. Haley collection, National Air & Space Museum

called at the Pendrays' Crestwood home. Mrs. Pendray, who showed them in and permitted a search, soon allayed their fears that there was assuredly no TNT. Soon after, a special meeting was called at the local American Legion Chapter in which the menace of rocket explosions was the chief topic. The potential loss of property value was also discussed as well as ways to convince the Pendrays to move.

These apprehensions about the danger of rocket experimentation were not altogether without substance. In the rocket series of 20 October 1935 a woman onlooker was injured. She was struck by a fragment of metal from a motor and was rushed to New Rochelle Hospital. The girl's elbow was so injured that she was not able to use her arm for a year. ARS members helped pay for the hospitalization. The ARS journal *Astronautics* never printed a word of this incident though the papers certainly did. The ARS directors also learned to absolve themselves from future potential lawsuits. In subsequent tests all participants and observers were obliged to sign the following statement: "I hereby agree to absolve the American Rocket Society, and its individual experimental personnel, from any claims of any nature whatsoever for injury or damage to person or property which might occur during the experiments conducted this day. This shall also apply to preparatory and concluding work incidental to the course of these experiments."

The experiments also resulted in a triumph. In June 1936, the Society learned it shared the International REP-Hirsch Astronautics Award with ARS member Alfred Africano for the most significant contribution made during the previous year towards the new "science" of astronautics. In reality, the REP-Hirsch Prize was given to the Society for its report on flight rockets of 1932-1934 as well as the first year of static tests; Africano's share of the $5,000 award was bestowed for his paper "Design of a Stratospheric Rocket," based upon ARS proving stand results. This was the first time Americans had won this Award which had been established by Robert Esnault-Pelterie ("REP") in conjunction with his friend the banker André Louis-Hirsch in 1928 for fostering the development of astronautics, including rocketry, towards the ultimate goal of achieving space flight.

The ARS and its now 200 members were proud of their accomplishments. Their report, of 1 January 1936, to the REP-Hirsch Committee of the Société Astronomique de France stated that the ARS "served as a nucleus for rocket research not only in America but abroad" and was a "central bureau for the exchange of information about rockets." "Most important of all" the report continued, the Society "brought rocket experiments, and the technical results of such experiments, out in the open as a regular, established branch of engineering."* In the section of the report titled "Future Plans," it is declared that "The Society expects to continue its experimental programme, and designs are now being prepared for an improved proving stand for further motor tests. This stand – on exhibition in the National Air and Space Museum, Washington, D.C. – was first used at New Rochelle, New York, on 22 October 1938. The new rig was largely the work of Pierce and Shesta and measured thrusts up to 200 lbf (90.7 kgf). A large electric clock face read increments of ten seconds and 100 seconds. The first motor tested was Pierce's tubular Monel model.

Meanwhile, from September 1937 to January 1939 Shesta, Pierce, Africano, the Pendrays and other ARS members carried out several series of experiments at Pawling, New York, and Mountainvale, New Jersey, with 4-and 6 lb (1.8-2.7 kg) skyrockets fitted with wings and fins of various shapes to determine at minimum cost the best configuration for stability. Typically, publicity concerning this and other ARS developments was exaggerated. *Life* magazine ran a four-page illustrated spread on the Pawling and Mountainvale tests in its 9 October 1939 issue, misleadingly heading the article "Technicians Design Model Rockets Hoping for Transatlantic Flight." Needless to say by this time the Society had no illusions about making any long distance rocket flights just yet, and certainly not with skyrockets.

8. THE WYLD ENGINE

The more important engineering work was conducted on ARS Test Stand No. 2 with liquid motors. James H. Wyld, a brilliant 28-year old physics graduate from Princeton University who had recently joined the Society's Experimental Committee, made the significant breakthrough of his regeneratively-cooled motor which was first tested during the stand's second trial at New Rochelle on 10 December 1938. In that run the Wyld motor was found almost cool to the touch after delivering more than 90 lbf (41 kgf) of thrust for 13.5 seconds. An exhaust velocity of 6,870 ft/sec (2,094 m/sec) and a thermal efficiency of 40% were calculated. "These figures," reads the test report, "are amongst the highest ever recorded." The Wyld engine, the first successful regeneratively-cooled rocket system in America, was further improved but not tested again on the stand until 1941. Wyld could devote precious little time to the rocket's development as he temporarily held a position with the National Advisory Committee for Aeronautics at Langley Field, Virginia.

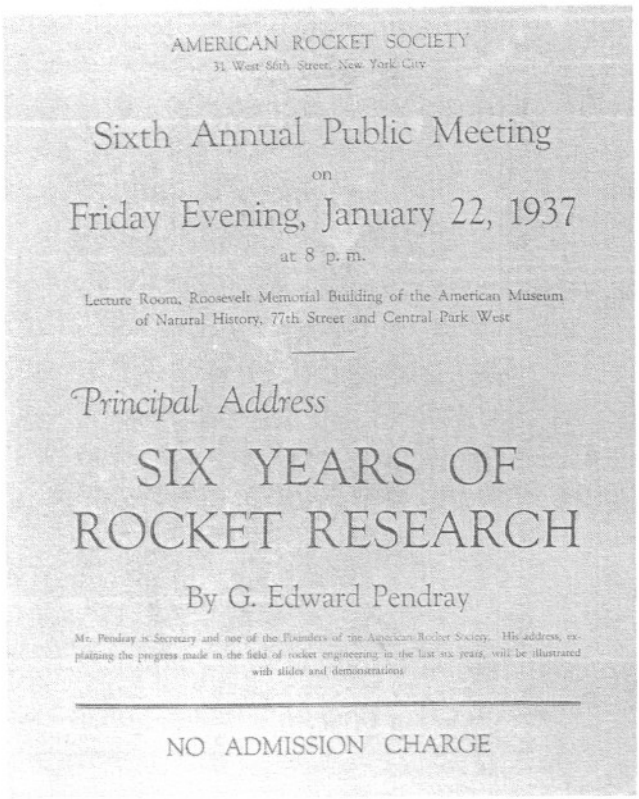
The final testing of the Wyld motor, made at Midvale, New Jersey, on in August 1941, according to the official report, "proved conclusively that a reliable motor for aerological [sic] sounding rockets has at last been designed, built and tested." The Wyld motor made three runs that hot summer afternoon with one run lasting "for the surprising time of 45 seconds."*

Wyld, together with Shesta, Pierce, and a new ARS member, Lovell Lawrence, Jr., were determined to cooperatively develop this motor for commercial exploitation. Lawrence then worked for the International Business Machines Corporation, being temporarily assigned to Washington, D.C. to supervise the operation of some electronic equipment. He was ideally suited, he felt, to approach military agencies to work out a Government contract.

The Navy's Bureau of Aeronautics showed particular interest and Lieut. Charles F. Fischer, USN, was dispatched to witness a test run of the engine. The test was successful though Fischer informed the rocketeers that it was not

* Of course other organizations and individuals were also making rocketry an "established branch of engineering." In February, 1936, a month after the ARS report, Frank Malina initiated the famous GALCIT Rocket Research Project of the California Institute of Technology which culminated in, amongst other milestones, America's first successful liquid-fuel sounding rocket, the WAC-Corporal. This rocket, as the second stage of a captured V-2, was the first rocket to reach outer space when Project Bumper soared to 250 miles on 24 February 1949. For this story and other GALCIT developments, see Frank Malina, "America's First Long-Range Missile and Space Exploration Programme," *Spaceflight*, **15**, December 1973, pp. 442-456.

* Several other motors were of course also tested on ARS Stand No. 2 during this period. These included motors built by Africano, Pierce, Nathan Carver, Robertson Youngquist (of the new Massachusetts Institute of Technology Rocket Club), and Charles Piecewiez



AMERICAN ROCKET SOCIETY
31 West 86th Street, New York City

Sixth Annual Public Meeting
on
Friday Evening, January 22, 1937
at 8 p. m.

Lecture Room, Roosevelt Memorial Building of the American Museum of Natural History, 77th Street and Central Park West

Principal Address

SIX YEARS OF ROCKET RESEARCH

By G. Edward Pendray

Mr. Pendray is Secretary and one of the Founders of the American Rocket Society. His address, explaining the progress made in the field of rocket engineering in the last six years, will be illustrated with slides and demonstrations

NO ADMISSION CHARGE

Announcement of talk "Six Years of Rocket Research" by G. Edward Pendray of the American Rocket Society, 22 January 1937.

customary for the Navy to grant contracts to individuals, only to corporations. He asked them, however, to make a complete report so that perhaps special consideration might be given. This was in late November, 1941.

9. INFLUENCE OF WORLD WAR II

Shortly afterwards, one Sunday afternoon, Wyld came to Shesta's home to help him complete the report. A radio played music in the background. Suddenly the music stopped. "We interrupt this programme," the announcer said, "to make an important announcement. Pearl Harbour has been attacked." The date was 7 December 1941. The following day America was at war with the Japanese.

Events thereafter moved swiftly for the fate of the Wyld motor and the complexion of the American Rocket Society itself was considerably altered. On 18 December 1941 Wyld, Lawrence, Shesta and Pierce formed a corporation called Reaction Motors, Inc. of Pompton Plains, New Jersey, near the former ARS proving field, and shortly sealed a Navy contract to develop the Wyld engine for the purpose of rocket-assisted take-off of heavily loaded seaplanes.* By the end of the war Reaction Motors was producing engines for some of America's first missiles. The company subsequently became one of the giants of America's aerospace industry, producing engines for such projects as the Bell X-1 rocket plane, the Navy's Viking sounding rocket, and the X-15 – this work traced back to a modest 90 lb (41 kg) regeneratively-cooled motor developed by the ARS Experimental Committee's James H. Wyld and tested on ARS Test Stand No. 2.

If the bombing of Pearl Habour represented a turning point in the successful story of the Wyld motor it also put the ARS into somewhat of a panic. Hugh Franklin Pierce who was then the Society's President as well as Vice-President of the newly formed Reaction Motors, Inc., declared in an open letter of 15 January 1942 to all Society members that: "As of 1 January 1942 the American Rocket Society has found it advisable to suspend activity for the duration of the emergency. This important decision was reached at a special meeting of the Board of Directors on 18 December 1941. Because of the military potentialities of rocket power it is deemed essential that the dissemination of further information on the subject be curtailed. Consequently, we are suspending the publication of *Astronautics*... you are urged to use discretion in talking of past experiments or in giving any information relative to rocketry which might be of aid to the enemy. Membership now in force will be 'frozen'..." By summertime 1942, the Board had calmed down and reached quite a different turn of mind. Roy Healy, then President, on 15 June 1942 announced, that "after due consideration, the Board of Directors ordered to resume activities of our Society as of 1 July 1942. Considering that the initial emergency period has passed and that technical progress must be encouraged to insure victory, the Board unanimously agreed that the Society should once again function as a source of essential information." *Astronautics* was revived and so were the "frozen" members!

The war years saw a universal marked interest in rockets, but for destructive or other military applications and not scientific purposes. This was reflected in the pages of *Astronautics* with articles on anti-aircraft rocket designs, German rocket motor patents which could potentially be used to power war planes such as the 112 fighter, rocket guns, winged rocket bombs, American Bazookas, Russian Katushas, German Neberlwerfers, British "Z" guns, the first jet aircraft, the V-1, and the V-2. Though one rare space article did get in the March 1944 issue, Robert L. Sterberg's "Electronic Spacial Rocket," which began "It has been some time since *Astronautics* has published any writing on interplanetary travel problems." "At times," the article continued, sight was lost "of the greatest possibility offered by rocket power – that delightful prospect of escaping from this frowsy, bloody, unhappy planet to some bright new world." Other ARS members felt that since rocketry was gaining "respectability" or professionalism, the interplanetary connection was still not wholly acceptable and that the engineering or practical applications should be stressed to attract newer members. G. Edward Pendray tried this tact on his own. During the war he was publicity head of Westinghouse Electric and afterwards directed his own public relations firm. He travelled a great deal and became, in the words of one newspaper, "a one man messiah" for the cause of rocketry and the ARS. By 1945 he had made over 300 speeches and written 500 articles mainly on the immediate promise and need to support rocketry in the post-war years, stressing less fantastic and more practical goals than space flight such as rocket-propelled or assisted aircraft, rocket mail carriers and so on. Mostly, he aimed his talks at the business and scientific communities, pointing out that the tremendous advances made in rocketry and guided missiles would develop into new industries which promised to spawn still other, highly profitable industries. His ultimate dream, of course, was to see this startling new war technology turned to a means of manufacturing the first spaceships.

During the war the ARS conducted practically no

* Three thousand miles away, in California, another pioneer American rocket company was organized about the same time, later known as the Aerojet Corp. It was not officially incorporated until 19 March 1942. Aerojet was an outgrowth of the GALCIT Rocket Research Project started by Frank Malina and under the direction of Dr. Theodore von Kárman of CalTech.

experimentation though did loan their Test Stand No. 2 to Reaction Motors for the company's initial work. As the military and industry unfolded astounding progress in the state-of-the-art with their huge resources, manpower and money at hand, there came a realization that the Society's role would have to be re-defined if it were to be viable in the post-war years. Instead of an essentially local, experimental group with limited cash reserves and lack of facilities, it would have to become a truly national, professional technical organization with educational rather than experimental functions. Aerojet, the GALCIT programmes, various military missile programmes, and the aircraft industry itself were situated in California or other western states. ARS membership in 1945 amounted to 600 throughout the states but meetings and other activities were confined to New York City. On 27 December 1944 an important meeting was held in the Engineer's Club in New York which was convened by the ARS Board of Directors including Pendray, Healy, Shesta, Wyld, Lawrence – and Robert H. Goddard.* Also present were the eminent Drs. Clark Millikan and Theodore von Kárman, Andrew G. Haley, and various Army officers, about fifteen people in all. The purpose of the meeting was to find ways to increase the Society's effectiveness with a view towards building a separate Society or branch on the West Coast, where rocket experts under the leadership of von Kárman were situated at the California Institute of Technology. The talk lasted all night but with no separate ARS being agreed upon and with the California rocketeers joining the Society headquartered in New York.

A more successful effort to modernise and expand the Society occurred the following year. On 7 March 1945 Pendray delivered one of his rocket talks before the Washington,D.C. Society of Engineers. Clarence E. Davies, Secretary of the American Society of Mechanical Engineers (ASME), afterwards chatted with Pendray and suggested a possible affiliation between the ARS and ASME, then one of the largest engineering organizations in the world. Subsequent committees of both groups were formed and on 2 November 1945 after appropriate voting the affiliation was consecrated. The ARS retained its autonomy and independence yet gained the following: increased membership; greater participation in technical sessions; more technical sessions; increased revenue and scientific standing; and a new headquarters, in the Engineering Society's Building in New York. By 1954 the Society had expanded to almost 4,000 and needed larger offices and thus moved to 500 Fifth Avenue, New York.

The same year also saw an enlarged, new technical journal called *Jet Propulsion* (it succeeded the *Journal of the American Rocket Society* which had succeeded *Astronautics* in 1945). Also in 1954, the ARS Space Flight Committee submitted a "Study of the Feasibility of an Experimental Earth Satellite" to the National Science Foundation. ARS members subsequently learned that the paper had played an influential role in leading President Eisenhower in July 1955, to announce intentions to launch a satellite as part of the International Geophysical Year. A subsequent ARS report of October 1957, following the Sputnik 1 launch, urged the start of a permanent national space programme directed by an independent Governmental agency. The National Aeronautics and Space Administration (NASA) was created the following January.

In the meantime, the ARS grew phenomenally, commensurate with the progress of the space programme and the growth of the aerospace industries. In 1958, at the time of NASA's formation, membership was 11,500. By

* Goddard did not remain aloof from the Society, but did not wish to share his experiments, with whom he rightly considered, in the early years, as amateurs and unprofessionals.

Left centre, two of the ARS delegates at the 4th International Astronautical Congress, Austria, 1954.

Andrew G. Haley collection, Smithsonian Institution

1959 it was 13,750 and by 1962 it soared to 20,450. By 1962 also, the ARS consisted of some 55 sections throughout the country, each section having its president and other officers. The sections represented geographical and membership concentrations like Alabama, Central Texas, Cleveland-Akron, Orlando, and Southern California. There were also 49 student chapters attached to universities and colleges. The work was steered by 11 standing and special commitees such as Awards, Education, IAF Congress, International Affairs, Public Education and Space Flight Report to the Nation, the late Werhner von Braun being Chairman of the latter committee that year. The ARS technical committees numbered 19 and covered all phases of astronautics from astrodynamics, communications and instrumentation, electric propulsion, human factors and bioastronautics, to space law and sociology, ramjets, propellants and combustion and underwater propulsion. The activities were just as broad and ranged from technical sessions in which papers were presented, to International Astronautical Federation (IAF) participation, a multitude of ARS publications, and huge public exhibits such as the "Space Flight Report to the Nation," held 9-13 October 1961 in the 220,000 square foot (20,438 square metre) New York Coliseum. Professional, school and university groups attended the event in which 500 organizations displayed their "space wares" and 300 papers were read in the technical sessions.

Yet in the same city was headquartered another dynamic organization equal to the size of the ARS and holding similar functions. This was the Institute of the Aerospace Sciences, founded in New York City in 1932, two years after the ARS. Initially, it was devoted to advancing aeronautics and was then called the Institute of Aeronautical Sciences. By the opening of the Space Age the IAS changed the names of its periodicals and its own name to indicate coverage of "total flight" comprising atmospheric and space flight. By 1962 it was clear in the words of ARS President, then New Zealand-born Dr. William H. Pickering of the Jet Propulsion Laboratory, Pasadena, California, that "the IAS and ARS have increasingly become overlapping

organizations in many areas of interest." Pickering also pointed out that the majority of the AIS' 17 technical committees paralleled those of the ARS, that IAS journals and other publications covered the same ground as the ARS and that "each Society is offering essentially the same services to its members." For efficiency's sake and for the common interest the Boards of Directors of both organizations decided upon a merger. An Ad Hoc Consolidation Study Committee formed of leading members of both the IAS and ARS met on 21 January 1962 to study the question further. After a year of very complicated negotiations, space law pioneer Andrew G. Haley serving as the general counsel for the ARS Consolidation Committee, an extraordinary set of meetings took place on 7 December 1962 in which ARS and IAS members completed voting for the merger.*

"It hurt me," said G. Edward Pendray. "I felt I lost part of my life. But I also knew that the merger was in everyone's interest and voted for it." The AIS and ARS thus ceased and became a new technical society known as the American Institute of Aeronautics and Astronautics (AIAA) with a starting membership of about 36,000 and headquarters both in New York and Los Angeles. AIAA's first president was Dr. Pickering. The new Society formally began operation 1 February 1963.

"With the last Annual Meeting, held in November 1962 at Pan Pacific Auditorium in Los Angeles," Pendray wrote, "ARS members could look back on three decades of growing technical and educational services to the professional community and to a tradition of advancing new concepts and innovations." He could personally look back with greater pride knowing that he was one of the dozen people who gathered in his apartment on the eve of the Depression to share and fulfil an impossible dream.

* Proxy voting actually took place 28-29 November and at that time over 85% were in favour of the merger. The New York meeting of 7 December was for New York members and to formalise the merger.

SOURCES

1. Personal interviews with G. Edward Pendray, David Lasser, William Lemkin, Charles van Devander, Bernard Smith, John Shesta, Alfred Africano and others.
2. *Bulletin of the American Interplanetary Society, Astronautics, Journal of the American Rocket Society,* and *Jet Propulsion.*
3. G. Edward Pendray Papers, Princeton University; Andrew G. Haley Papers, National Air and Space Museum.
4. John Shesta with Frank H. Winter, "Reaction Motors Incorporated – The First Large Scale American Rocket Company: A Memoir," unpublished International Astronautical Federation papers presented at the 29th IAF Congress, Dubrovnik, Yugoslavia, 1-8 October 1978.
5. G. Edward Pendray, "The First Quarter Century of the American Rocket Society," *Jet Propulsion,* **25**, November 1955, pp. 586-593.
6. G. Edward Pendray, "32 Years of ARS History," *Astronautics and Aerospace Engineering,* **1**, February 1963, pp. 124-128.
7. G. Edward Pendray, "Why Not Shoot Rockets?" *Journal of the British Interplanetary Society,* **2**, October 1935, pp. 9-12.
8. David Lasser, "How The Rocket Works," letter to the editor, *New York Evening Post,* 7 August 1930.
9. David Lasser, "On Rocketeering." letter to the editor, *New York Evening Post,* 19 July 1930.
10. "Technicians Design Model Rockets Hoping for Transatlantic Flight," *Life,* 7, 9 October 1939, pp. 37-40.
11. G. Edward Pendray, "Early Rocket Developments of the American Rocket Society," in Frederick C. Durant, III and George S. James, eds., *First Steps Toward Space* – Smithsonian Annals of Flight No. 10 (Smithsonian Institution Press: Washington, D.C., 1974), pp. 141-155.
12. "You Ought to Know... G. Edward Pendray," *Advertsing Age,* 11 June 1945.
13. Lucy Greenbaum, "Quest For Fiction Data Started Pendray On Road To Fame As A Scientist," White Plains, N.Y. *Times,* 26 February 1937.
14. "Pendray Quitting Post With Westinghouse," *Pittsburgh Sun Telegraph,* 22 July 1945.

Concluded from page 286:

8. Harold Goodwin, *The Images of Space,* Holt Rinehart and Winsion, Inc., 1965.
9. *Spaceflight* July , 1979.
10. *New York Times Yearly Index,* 1957, page 70.
11. Philip J. Klass, *Secret Sentries In Space,* page 23, Random House, 1971.
12. Erlk Bergaust, *Wernher von Braun,* page 267, National Space Institute.
13. *Time* August 12, 1957.
14. *Aviation Week* Sept. 2, 1957.
15. *Aviation Week* Sept. 16, 1957.
16. *U.S. News & World Report* Oct. 4, 1957.
17. Green, Lomask, *Vanguard; A History*, NASA SP 4202, 1970, pages 185, 186.
18. Nicholas Daniloff, *The Kremlin & The Cosmos,* Alfred A. Knopf, Inc., 1972.
19. Gene & Clare Gurney, *The Launch of Sputnik,* Franklin Watts, Inc., 1975.
20. Arthur C. Clarke, *The View From Serendip,* Random House, 1977.
21. *Time* Oct. 14, 1957.
22. *Vanguard,* pages 187,188.
23. *U.S. News & World Report* Oct. 18, 1957.
24. *New York Times* Oct. 9, 1957.
25. *New York Times* Oct. 10, 1957.
26. *New York Times* Oct. 18, 1957.
27. *New York Times* Oct. 16, 1957.
28. *Countdown For Tomorrow* Chapter 7.
29. *Newsweek* Oct. 28, 1957.
30. Richard S. Lewis, *Appointment On The Moon,* Chapter 2, Viking Press, 1969.
31. *New York Times* Oct. 24, 1957.
32. *Newsweek* Nov. 4, 1957.
33. *Aviation Week* Nov. 4, 1957.
34. Gibney & Feldman, *The Reluctant Space-farers,* Signet Books, 1966.
35. *U.S. News & World Report* Nov. 8, 1957.
36. *New York Times* Oct. 7, 1957.
37. *Soviet Space Program 1971-1975 Vol. 1,* U.S. Library of Congress.
38. *New York Times,* Oct. 16, 1957.
39. *New York Times,* Nov. 6, 1957.
40. *Countdown For Tomorrow,* Chapter 15.
41. *New York Times* Nov. 5 and 7, 1957.
42. Arthur C. Clarke, Ed., *The Coming Of The Space Age,* Meredith Press, 1967.
43. Richard Witkin, Ed., *The Challenge of the Sputniks,* Doubleday, 1958.
44. *Vanguard,* page 198.
45. *Challenge of the Sputniks.*
46. *New York Times* Nov. 12, 1957.
47. Richard S. Lewis, *From Vineland To Mars,* Quadrangle, 1976.
48. *Time* Dec. 16, 1957.
49. *Vanguard,* pages 208-210.
50. *Vanguard,* page 212.
51. *New York Times* Dec. 13, 1957.
52. Willy Ley, *Rockets, Missiles & Man In Space,* pages 393, 394, New American Library, 1968.
53. *New York Times* Dec. 23, 1957.
54. Great Events of the 20th Century, page 426, *Readers' Digest,* 1977.
55. *The Glory And The Dream,* pages 791 and 792.
56. *U. S. News & World Report* Dec. 20, 1957.
57. *Time* Oct. 14, 1957.

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CONTENTS PAGE

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