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THE WHITE HOUSE
WASHINGTON

August 29, 2016

I am pleased to join in celebrating the 60th anniversary of the Defense Science Board.

For the past six decades, the Defense Science Board has worked to protect our Nation against threats posed by weapons of mass destruction, cyber attacks, enemy states, and non-state actors. Understanding the changing landscape of the world we live in, you have contributed critical analysis and fostered important development of our Nation’s defense capabilities—helping us mitigate threats before they arise and ready our military for the future. In celebrating your 60 years of service, we are reminded of how far our Nation has come since the Defense Science Board was founded and of how experts like you are keeping our people—and people around the globe—safe and free.

As you mark this special occasion, I wish you the best.

[Signature]

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THE SECRETARY OF DEFENSE
WASHINGTON

Message for the Defense Science Board 60th Anniversary

I am proud to recognize the Defense Science Board’s contribution over sixty years of progress in defense science and technology and its relationship to the national security of the United States.

As a former member of the Board and often as one of its sponsors and customers, I have a particularly deep appreciation for the value of the impartial and objective advice provided by the Defense Science Board. From its earliest days, the Board has focused on critical defense issues at the strategic and tactical levels. During my tenure as Secretary of Defense, the Board’s advice has provided an important input to the Department in meeting the new challenges facing our Nation—from preparing for new dimensions of war to new initiatives for streamlining the operation of our Nation’s defense establishment.

Clearly the Nation and the Department of Defense will continue to call on the Defense Science Board for its wise counsel and advice in the days ahead. You have my full support for such critical work and my heartiest congratulations on six decades of dedicated and creative service to your country.

With best wishes,

[Signature]
Message for the Defense Science Board 60th Anniversary

I want to extend my greetings to the Defense Science Board as you gather on the occasion of your 60th anniversary.

For the past six decades, you have provided top-notch, independent advice to the Department of Defense. At this critical point in the history of our Nation, the United States has the opportunity to use new technologies to allow humans to make better decisions, perform better in combat, and be more effective in the defense of our Nation. As we work to refine our policies and processes to support this goal, your efforts are more important than ever.

You have my appreciation and respect for your valuable contributions to our country’s security. I wish you all the best for your anniversary celebration.

Sincerely,

[Signature]

My first serious involvement with the Defense Science Board was precisely half of its remarkable 60 year history ago. In 1986 I was asked by the first USD(A), Richard Godwin, to be the Executive Secretary for a Defense Science Board task force on President Reagan's Strategic Defense Initiative. This was the first of many ensuing opportunities I've had to work with some of the giants and legends of the defense technology, engineering, and acquisition management fields.

After 30 years of involvement with the DSB, as a government advisor, as a participant in several studies, and as a customer for the DSB's products, I remain in awe of the intellectual talent, experience, and wisdom that the DSB provides, on a pro bono basis, to helping the Department of Defense address its most difficult problems. The contributions of the DSB are many, but for me, the opportunity to work with, learn from, and sometimes be mentored by such outstanding individuals is an exceptional privilege.

Congratulations to all current and past members for 60 years of amazing contributions to our national security, and to peace and stability in an ever changing, but always dangerous world. Well done!

[Signature]

Frank Kendall
Under Secretary of Defense for Acquisition, Technology, and Logistics
To the Defense Science Board,

Warm greetings to all the past and current members and staff of the Defense Science Board as you gather to celebrate your 60th anniversary.

Over the past 60 years, the Defense Science Board has performed an invaluable role as an impartial and objective advisory group for the Department of Defense on issues vital to the security of the United States. Your expertise on advanced technology applications, new military operational concepts, and international business practices has enabled us to strengthen our national security infrastructure during a period of dramatic change.

In the coming years, efficiently capturing this Nation's robust science and technology resources—whether within the Department's direct resources or in the private or university sectors—will be one of our most important challenges. The Defense Science Board has been and remains a leading agent in helping us meet that challenge, and I want to commend all of you for your outstanding service to the Department and to the Nation on this special occasion.

Sincerely,

PAUL J. SELVA
General, U.S. Air Force
The Defense Science Board serves as the Federal Advisory Committee chartered to provide Department of Defense leadership with “independent advice and recommendations on science, technology, manufacturing, acquisition processes, and other matters of special interest to the DoD... and [to] ensure the identification of new technologies and new applications of technology in those areas to strengthen national security.”

The Board was established in 1956 in response to recommendations of the Hoover Commission: The Assistant Secretary of Defense for Research and Development will appoint a standing committee, reporting directly to him, of outstanding basic and applied scientists. This committee will canvass periodically the needs and opportunities presented by new scientific knowledge for radically new weapons systems. The original membership of the Board, totaling twenty-five, consisted of the chairman of the eleven technical advisory panels in the Office of the Assistant Secretary of Defense for Research and Development, the chairmen of the senior advisory committees of the Army, Navy, and Air Force, the Directors of the National Science Foundation, the National Bureau of Standards, and the National Advisory Committee for Aeronautics (predecessor of the National Aeronautics and Space Administration), the President of the National Academy of Sciences, and seven members at-large drawn from the scientific and technical community.

The Board met for the first time on September 20, 1956. Its initial assignment concerned the program and administration of basic research, component research, and the advancement of technology in areas of interest to the Department of Defense. On December 31, 1956, a charter was issued specifying the Board as advisory to the Assistant Secretary of Defense for Research and Development. Following the consolidation of the offices of the Assistant Secretaries of Defense for Research and Development and Applications Engineering in 1957, the Board reconstituted as advisory to the Secretary of Defense through the Assistant Secretary of Defense for Research and Engineering. Its membership was increased to twenty-eight, including as ex officio members, the Chairmen of the President’s Science Advisory Committee and the Scientific Advisory Committee in the Office of Guided Missiles, Office of the Secretary of Defense (OSD). A revised Board charter was issued on October 30, 1957.

In accordance with the Department of Defense Reorganization Act of 1958, which stipulated the responsibilities, functions, and authority of the Director of Defense Research and Engineering (DDR&E), the Board’s charter was revised on November 23, 1959. This revision harmonized the role and mission of the Defense Science Board with DDR&E’s responsibilities, prescribing eight members-at-large and modifying ex officio membership to conform with the establishment or dissolution of advisory panels in the office of the DDR&E. In the course of organizing his staff, the DDR&E appointed assistant directors for several types of warfare systems. Following this action in late 1959, the Board made a study of the structure of scientific and engineering advisory bodies. Its report on this study was implemented by DoD Directive 5129.22, “Defense Science Board Charter,” dated April 10, 1961. This directive was revised and reissued on February 17, 1971.
In 1978, the title, Director of Defense Research and Engineering, was changed to Under Secretary of Defense for Research and Engineering (USDRE). On July 1, 1986, the title, Undersecretary of Defense for Research and Engineering, was changed to Under Secretary of Defense for Acquisition USD(A). On January 1, 1990, the Defense Manufacturing Board, which had reported directly to the USD(A), merged into the Defense Science Board, adding manufacturing issues to the list of items of interest. In 2011, the title, DDR&E was changed to Assistant Secretary of Defense for Research and Engineering, ASD(R&E). The Board reports directly to the Secretary of Defense through the USD(AT&L) while, at the same time, working in close coordination with the ASD(R&E) to develop and strengthen the Department’s research and development strategies.

In recognition of the outstanding advice provided by the DSB to the Department over the past forty plus years, the Secretary of Defense established the Eugene G. Fubini award in 1996 for Outstanding Service to the Defense Community in an Advisory Capacity. This special honor marked yet another important milestone in the Board’s long and distinguished history of service to the department and the nation.

Currently, the Board’s authorized strength is forty-eight members and seven ex officio members, including the chairs of the Army, Navy, and Air Force advisory committees, and the Defense advisory committees on Policy, Business, Health, and Innovation. The Board’s forty-eight members are appointed for terms ranging from one to four years and are selected on the basis of their preeminence in the fields of science, technology and its application to military operations, research, engineering, manufacturing and the acquisition process. The Board operates by forming task forces consisting of Board members and other experts to address those tasks referred to it by formal direction. The products of each task force typically consist of a set of formal briefings to the Board and appropriate DoD officials, and a written report containing findings, recommendations and a suggested implementation plan.

Over the past 60 years, the DSB has advised senior leaders on pressing and complex technology issues facing the Department of Defense in research, engineering, and manufacturing in combination with strategy, tactics, operational concepts, and other factors. Through addressing the Department’s most irksome, consequential, and unstructured problems that involve science and technology, the Board has a rich history of identifying new technologies and applications in many areas that strengthen national security.
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Dr. J. Ernest Wilkins, Jr.
Mr. Earle C. Williams
Dr. Patrick H. Winston
1957

Dwight D. Eisenhower 1953–1961

U.S. President

Eisenhower Doctrine
Civil Rights Act of 1957
Soviets launch Sputnik; "space race" begins

1958

NASA formed
The integrated circuit is invented
ARPA formed
National Defense Education Act (NDEA)

1959

Cuban Revolution
Alaska and Hawaii become U.S. states

1960

Space Race: 1957–1975
U-2 plane shot down over the USSR
Civil Rights Act of 1960

1961

Vietnam War, U.S. involvement
Eisenhower’s "military-industrial complex" farewell address
Bay of Pigs Invasion
Berlin Crisis

Mr. Neil H. McElroy 1957–1959

Mr. Thomas S. Gates, Jr. 1959–1961

Mr. Robert S. McNamara 1961–1967

SECRETARY OF DEFENSE

DSB CHAIR

Dr. Howard P. Robertson 1956–1961

MAJOR DSB REPORTS

Limited War

The Technology of Human Behavior
Structure of Scientific and Engineering Advice
Biological and Chemical Weapons Development

Government In-House Laboratories

MIM-14 Nike Hercules
B-66
M50 Ontos
M103
M60
BMEWS
AFSAM-7
USS George Washington
F-104A
Sidewinder
F-4 Phantom
Polaris A-1
M79 grenade launcher

12
**1962**
- Kennedy 1961–1963
  - John Glenn is the 1st American to orbit the Earth
  - Cuban Missile Crisis
  - 1st industrial robot introduced

- Atomic Test Ban Treaty
- Martin Luther King, Jr. “I have a dream” speech
- President Kennedy assassination

**1963**
- Lyndon B. Johnson 1963–1969
  - Gulf of Tonkin Resolution
  - The Beatles vault to #1 in America starting the British Invasion
  - Civil Rights Act of 1964

- Mariner 4 space probe is launched to photograph Mars

**1964**
- U.S. involvement in the Vietnam War escalates
- Voting Rights Act
- Gemini 5
- 1st one-week manned space flight

**1965**
- 1st SR-71 “Blackbird” goes into service
- “Miranda rights” established
- Surveyor 1 becomes the first U.S. spacecraft to soft-land on another world
- The Freedom of Information Act

**1966**
- S. McNamara 1961–1968
  - CH-46 Sea Knight
  - A-6 Intruder
  - Kaman SH-2 Seasprite
  - AN/VRC-12
  - M63
  - Hughes OH-6 Cayuse
  - M114
  - AC-130A Spectre
  - E-2 Hawkeye
  - Bell AH-1G
  - CH-53 Sea Stallion
  - MIM-23 Hawk
  - MK II PBR 1966 Stallion

**Dr. Clifford C. Furnas 1962–1963**
- Encouragement of Innovation
- Scientific and Technical Information
- Ballistic Missile Defense
- Policy in Support of Basic Research
- The Military Role in Space

**Dr. Frederick Seitz 1964–1968**
- DoD Basic Research Policy
- Research in DoD on Internal Conflict and insurgency in Developing Countries
- West Ford Communication Techniques
- Project “Agile”
- Technical Military Personnel
- Management of R&D

**Civilian Technical Personnel in the DoD**
- Review of IDA Reports
- Management of Electronic Warfare
- Ballistic Missile Defense
- Vulnerability
- Federal Contract Research Centers
- In-House Laboratories
- Incentive-Type Contracting in the Procurement of RDTE
1972

President Nixon visits China
Watergate scandal
SALT I Treaty signed
The last U.S. ground troops withdrawn from Vietnam

1973

Roe v. Wade Supreme Court Ruling
Skylab launch
1st hand-held cellular phone call is made
The World Trade Center officially opens

1974

President Nixon resigns
Arab Oil Embargo
1st Oil Shock
India test detonation of their first nuclear weapon

1975

Fall of Saigon
Microsoft is founded
Apollo and Soyuz orbital docking
Saturday Night Live premieres

1976

American Bicentennial
The first 4.8 miles of the Washington, D.C. Metro system opens
Apple Computer Company founded
Construction of the 1st space shuttle, Enterprise, completed

**Gerald R. Ford** 1974–1977

Détente: 1969–1979

Mr. James R. Schlesinger 1974–1975

Mr. Elliot L. Richardson 1973–1974  
Mr. Donald H. Rumsfeld 1975–1977

LVTP-7
Ruger Mini-14
S-3 Viking
F-15 Eagle
A-10 Thunderbolt II (Warthog)

LVTP-7
Ruger Mini-14
S-3 Viking
F-15 Eagle
A-10 Thunderbolt II (Warthog)

USS Mount Whitney
Wang 2200
Xerox Alto Workstation
Paveway I
KC-130R

USS Mount Whitney
Wang 2200
Xerox Alto Workstation
Paveway I
KC-130R

1971–1973

**Tape**

- Review of Safeguard Vulnerability
- Tactical Warning
- Review of the B-1 Bomber
- Management of ELINT Resources
- Remotely Piloted Vehicles
- Special Defensive Systems
- Strategic C³
- Avionics
- Tactical Warning and Attack Assessment
- Reducing Costs of Defense Systems Acquisition
- Net Assessment of Unidentified R&D Activities
- Tactical C³
- Test and Evaluation
- Electronics Management
- Net Assessment of Critical Deficiencies
- Side-Looking Radar
- Systems Vulnerability Report on Fratricide
- Positive Control Launch of the B-52 Programs
- Evaluation of Tactical Weapons Development Programs
- The 1973 Middle East War
- Electronic Battlefield: Target Activated Ground Sensors
- Surface Naval Warfare
- Analysis of Independent R&D Bid and Proposal
- Large-Scale Electro-Magnetic Pulse Simulators
- Gun System Acquisition
- Critical Intelligence Questions
- Net Technical Assessment
- DoD Dependence on Space Systems
- An Analysis of Export Control of US Technology
- DoD Space Shuttle Utilization
- Training Technology
- Federal Contract Research Center Utilization
- Verification: Cruise Missiles
- Identification Friend, Foe or Neutral
- Theater Nuclear Forces R&D Requirements
- Net Technical Assessment of Soviet Civil Defense
- KC-135 Tanker Hardness Review
- Surface Naval Warfare
- Verification of National Technical Means
- Technology Base Strategy
- Fundamental Research in Universities
- Strategic Cruise Missiles
- Industrial Readiness Plans and Programs
- ICBM Accuracy

**Dr. J. Solomon Buchsbaum** 1974–1977

15
# Celebrating Innovation for National Security

## 2012
- President Obama visits Myanmar, pushes for Democracy
- Crimea annexed by the Russian Federation
- China builds islands in the South China Sea for military bases
- Syrian Refugee Crisis in Western Europe
- NASA and Lockheed Martin unveil the 1st Orion spacecraft
- Edward Snowden, publication of classified data
- Superstorm Sandy

## 2013
- The ban on women serving in combat is lifted
- The North Korean crisis
- Russia and Cuba restore diplomatic relations
- New Horizons probe sends 1st close-up pictures of Pluto

## 2014
- American-led airstrikes against ISIS begin in Syria and Iraq
- Tesla Model X introduction
- U.S. and Cuba restore diplomatic relations
- New Horizons probe sends 1st close-up pictures of Pluto

## 2015
- Syria: 1st female U.S. Presidential candidate

## 2016

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### Panetta 2011–2013
- ARES-16
- Avenger (Predator C)
- USS America

### Mr. Chuck Hagel 2013–2015
- RQ-21A Blackjack
- USS Comado

### Dr. Ashton Carter 2015–present
- F-35B Lightning II
- USS Gerald R. Ford

### Dr. Craig I. Fields 2014–present
- Technology and Innovation Enablers for Superiority in 2030
- Air Force Nuclear Enterprise Follow-On Review
- Resilient Military Systems and the Advanced Cyber Threat
- Cyber Security and Reliability in a Digital Cloud
- Contractor Logistics in Support of Contingency Operations Assessment of Nuclear Monitoring and Verification Technologies
- Strategic Surprise 21st Century Military Operations in a Complex Electromagnetic Environment
- Autonomy
- Energy Systems for Remote and Forward Operating Bases*
- Defense Strategies for Advanced Ballistic and Cruise Missile Threats*
- Cyber Defense*
- Air Dominance*
- Cyber Deterrence*
- Next-Generation Unmanned Undersea Systems*
- Deterrence, Preventing, and Responding to the Threat or Use of Weapons of Mass Destruction*
- Defense Strategies for Ensuring the Resilience of National Space Capabilities*
- Cyber Supply Chain*
- Military Satellite Communication and Tactical Networking*
- Defense Research Enterprise Assessment*

* in progress
The Board Today

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DSB in its 6th Decade

The following themes and descriptions of major recent studies undertaken by the Board are illustrative of its continuing focus on issues of greatest concern to the nation’s security.

**Protecting the Homeland: Against non-state actors; against enemy states in time of war; against weapons of mass destruction and cyber**

Since 9/11, the US can no longer be considered a sanctuary. The highest priority for the DoD is protection of the homeland. The DSB has undertaken a series of studies to help clarify the DoD’s roles and to assess its posture for both defending the homeland and protecting it from new forms of threats that have evolved since the Cold War. The DoD’s dependence on critical infrastructure, the supporting capabilities it will need to provide to civil authorities, and shortcomings in the interagency have been highlighted.

With respect to the threat to the homeland, the DSB has produced over 20 years of studies characterizing how the threat has evolved since the end of the Cold War. Actors have proliferated beyond nation states, and so too have their tools. Missiles with range or delivery mechanisms to threaten the US homeland are in the hands of more nations. The cyber threat is growing exponentially in its presence and can be promulgated with serious harm by individuals. Advances in technology can place even weapons of mass destruction—nuclear, chemical, and biological—in the hands of any state or non-state actor that desires them. What to do about these threats, both defensively and offensively, at home and abroad, has been a subject of routine DSB investigation.

**Preventing large scale war: Nuclear deterrence**

Despite the “peace dividend” at the end of the Cold War, the DSB has been uncertain that downplaying the nation’s nuclear deterrent would lead other nations to do the same, even as advances in our non-nuclear warfighting capabilities proved their effectiveness. In fact, US conventional dominance demonstrated in Bosnia, Iraq, and Afghanistan appears to have catalyzed a greater interest in nuclear weapons by others who do not have the resources to overmatch us otherwise.

The Board has maintained steady attention for two decades on the health of the US nuclear enterprise, the advances and modernization efforts being undertaken by Russia and China, nuclear weapons proliferation to other nation states, and advances in technology that could both detect and hide proliferation. With the relatively recent recognition by DoD leadership of threatening nuclear capabilities and doctrine by many unfriendly to the US, a renewed commitment to the nation’s nuclear deterrent is being made. The DSB’s history in this area is helping the Department to re-teach a largely atrophied knowledge base to support both modernization of our forces and operational readiness to deter nuclear aggression.
Preparing for the new kind of war: War short of all-out war is becoming the norm

As nations have realized that they cannot match the US with conventional military might, they have adopted strategies and tactics designed to stay below the threshold of a major international armed response; witness Russia in the Crimea, China’s island-building in the South China Sea, and North Korean provocations. Their tools and techniques include information operations, using both disinformation and strategic communication aimed at their populace, neighbors, and the world at large; ambiguity of forces (‘little green men’, proxies, and naval forces labeled ‘coast guard’); and coercion involving economics, energy, and political corruption. The DSB has undertaken studies to identify the options for DoD in addressing this “new normal” category of threats and to highlight the role of other parts of the government critical to successfully countering such strategies.

Preparing for a new dimension of war: What the information infrastructure is enabling—for adversaries and for us

Information has become a decisive and discriminating enabler of modern warfare, and information superiority a potent deterrent. The DSB has undertaken a series of studies highlighting how DoD can achieve and maintain information superiority, focusing on intelligence collection and analysis, the use of unclassified ‘big data’, and the rapidly advancing technologies of information and communication infrastructures.

The criticality of information—its assured availability and integrity, and the vulnerabilities in providing it—has been realized by both us and our adversaries. The Board has advised on both offense and defense in this domain, including the growing threats and opportunities in electronic warfare and in cyber. As an example, the Board’s cyber efforts have addressed: matching our defenses to the sophistication of the threats and criticality of the target; managing cyber defense so as to make optimal use of funding and of scarce technical human resources; identifying the challenges and opportunities of cyber relative to new technologies, such as cloud computing; identifying strategies to mitigate cyber corruption of the supply chain, especially foreign supplied microelectronics; and how to deter cyber attacks when defenses are inadequate.

Anticipating new ways to wage war: Numbers and disaggregation; range; autonomy; danger on and above the surface is driving us under the sea

The unmatched capabilities of our joint forces depend on relatively small numbers of extremely capable, high value assets; e.g., the world’s most potent aircraft carriers. Predictably those unique assets have become lucrative targets of adversary states, calling into question some of our foundational operational tenets such as air dominance. The DSB’s work in this area has advocated ways to operate at greater range from the adversary to increase safety; use of large numbers of inexpensive assets to augment small numbers of costly assets (“quantity has a quality all its own”); and use of carefully managed autonomous systems to
keep Service personnel out of harm’s way. In addition, capitalizing on our undersea dominance, the DSB has identified ways to maintain that superiority for some time to come through the use of large numbers of inexpensive unmanned undersea vehicles to conduct operations that would otherwise have to be undertaken with greater risk from the air, sea or land.

**Supporting stabilization, reconstruction, peace keeping, and nation building**

Taking lessons from history, the DSB has highlighted the importance of comprehensive planning and preparation before, through and after conflict in order to secure both short and longer term stability once hostilities cease. Issues the Board has addressed include: identification of the information and intelligence required to successfully conduct stabilization and reconstruction operations; best use of the National Guard and Reserves with their civilian sector skills; language and cultural training; and campaign planning and exercising for stabilization and reconstruction missions on par with what we do for combat missions.

**Preparing for surprise: To us and by us**

The world is an unpredictable place, and the galloping advance of technology is making it more so. No matter how well DoD plans and prepares, there will be surprises—and there is the ever present value of inflicting surprise on our adversaries. The DSB has provided studies advising DoD on how the Department can be better poised to swiftly respond to surprise with agility, adaptability and resilience (e.g., having a technology infrastructure which can be swiftly and inexpensively revectored to meet changing needs and threats; using more red teaming and free play in training and exercises). The Board has also identified potential technological surprises and advised on hedging strategies should those occasions arise.
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<th>Year</th>
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<td>Eugene G. Fubini</td>
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<td>Dr. John S. Foster, Jr.</td>
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<td>1999</td>
<td>Dr. Joseph V. Braddock</td>
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<td>Mr. Norman R. Augustine</td>
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<td>2001</td>
<td>Mr. Charles A. (Bert) Fowler</td>
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<td>2002</td>
<td>Mr. David R. Heebner</td>
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<td>2003</td>
<td>Gen Larry D. Welch, USAF (Ret.)</td>
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<td>Dr. Robert J. Hermann</td>
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<td>Dr. James R. Burnett</td>
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<td>Mr. Robert R. Everett</td>
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<td>Mr. Dan Fink</td>
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<td>Dr. Richard Wagner</td>
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<td>Mr. Larry Lynn</td>
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<td>Mr. Robert Stein</td>
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<td>Dr. Miriam John</td>
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