

Table 1

## **THE EMERGENCE OF MRS**

### **APRIL 1966**

Idea of new "materials society" discussed at business meeting.

First International Conference on Characterization of Materials (ICCM-I), University Park, PA, organized and chaired by R. Roy (Penn State).

### **APRIL 1967**

Need for professional organization in field of materials is raised with national leadership.

Letter sent to F. Seitz, (President, NAS) from Roy.

### **MAY 1968**

Federation of Materials Societies (or American Institute of Materials) proposed and discussed. N. Promisel champions that cause henceforth.

National Research Council meeting. Roy introduces topic as a representative of the American Chemical Society.

### **JUNE 28, 1968**

Committee on intersociety cooperation in materials (CICM) appointed by Seitz via Promisel; CICM holds first of several meetings.

CICM meets. The committee includes Promisel (director, NMAB), Roy, H.C. Gatos (MIT), N.B. Hannay (vice president, Bell Labs), R.A. Huggins (ARPA), and I. Warshaw (NSF).

### **NOVEMBER 1968**

First proposal written for establishment of a national materials science and engineering society. Letter from J.H. Schulman, NRL, cites his and DOE and ARPA managers' opposition to a new society.

ICCM-II held at Rochester, NY. Roy proposal on a new society discussed and voted on by attendees; favored by a 3:1 margin.

### **APRIL 14-16, 1969**

At breakfast meeting (April 16) of W.O. Baker (Bell Labs), Warshaw, Huggins, and Roy, the decision is made to support (a) NAS study (COSMAT), (b) Federation of Materials Societies (FMS), and (c) a new society.

National Colloquy on Field of Materials, University Park, PA (first materials policy meeting ever); chaired by Roy.

### **JANUARY 26, 1970**

First draft of scope of society and purposes; meetings outlined.

Roy mails agenda for meeting to found "Materials Science Society" to E. Baer (CWURU), Gatos, Hannay, R. Hanneman (GE), M.B. Myers (Xerox), Warshaw, and L. Weisberg (RCA). Meeting held at "House of Chan," Chinese Restaurant, New York City.

This is the story of the conception, gestation, birth, and infancy of the Materials Research Society. It is of uncommon significance since it is the record of the United States' first attempt to institutionalize an interdisciplinary field. "Materials research" still represents the pioneer and largest field, where the paradigm of western science's fissiparous evolution has been stopped and partly reversed. It was not an easy path. It is far from complete.

# **MRS: Conception, Gestation, Birth, and Infancy**

Rustum Roy

I will begin by describing the setting of the national research activity in materials from World War II onwards, because that 10- to 15- year period was the seedbed in which it all started. Two parallel developments marked the 1945-55 decade.

The first was the rise to world-power status of American industry, playing, albeit, on a very tilted playing field. This success was the cause, not the result of *the buildup of an enormous and extraordinarily successful research enterprise*. That was the era of the great research labs: Bell, GE, DuPont, IBM, United Aircraft, etc., the cathedrals of postwar culture. And the products? The transistor, superalloys, new polymers, synthetic diamonds—all eloquent testimony on how industry could do materials research well and profit from it.

Second, for the first time in history, the federal government entered the research area—in a major way—as a funder. First the Department of Defense, then the National Science Foundation, then a dozen other agencies were set up in the 1945-50 time period, and they started to disburse funds to universities on a scale unimaginable a few years earlier. Regrettably, in hindsight, all this money was given in pure disciplinary categories, instead of being given to solve problems. Hence, interdisciplinary problem-oriented research, which was supported in modest ways by industry, essentially died on all U.S. campuses. Whether it can seriously be revived remains moot. Barely one or two exceptions exist. Arthur von Hippel's\* radiation lab on the MIT campus is perhaps the national model of what can be done. At Penn State, during this time, teams of crystallographers from Pepinsky's lab in physics, our materials synthesis group in geochemistry, and the polymer group in engineering science and mechanics were working together and had discovered that cooperative, interactive research in materials clearly worked. With that background, Penn State and Carnegie Mellon University, as noted by Robert L. Sproull, director of the Advanced Research Projects Agency (ARPA), made the first proposal for group interdisciplinary research in 1957. The proposal was not funded because there was no agency structure to even consider such a proposal!

But interdisciplinarity had much more powerful advocates. Industry leaders felt that government funding of individual researchers alone and its disconnection from problems was not functional. Especially through people such as William O. Baker and G. Guy Suits, vice presidents of research for Bell Labs and GE, respectively, industry approached the government—specifically the Department of Defense—to arrange for "block funding" of materials research. Out of this development, starting in 1960, came ARPA's interdisciplinary materials research laboratories (IDMRLs), with a mandate not only to turn out personnel trained in modern interdisciplinary research, but also to link these researchers and their work to industry as well. If anyone is the grandfather (godfather?) of materials research and of MRS, it is W.O. Baker, the gray eminence of science policy, who was guiding Bell Labs, advising presidents and agencies, incessantly pushing the cause of long-term purposive research,

\*It was not difficult for Harry Gatos, his associate, and I, who was linked to him through our common focus on  $BaTiO_3$ , to name our highest prize after him.

chairing COSMAT (Committee on the Survey of Materials Science and Engineering), and so forth.

Not only did ARPA start a dozen IDMRLs in as many universities, with another half dozen being started by the Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA) but, beginning with Penn State in 1962, several universities started a more stable trend—establishing university MRLs independent of any agency contract. (Many IDMRLs simply disappeared from their campuses when their contracts terminated.) Late into the 1960s, it appeared, from the rhetoric and self-congratulation by the agencies, that the flag of *interdisciplinary* materials research was flying high. But to many perceptive participants, the reality was *very* different. The ARPA and DOE contracts were seen largely as annual pie-dividing operations. Relevance and connection to industry was exactly as small as it had been before. Disciplinarity reigned supreme on every campus. Professional materials societies had not changed one whit.

A few isolated research groups on college campuses kept the flag of interdisciplinarity flying. It was this band of malcontents, highly critical of the status quo, who met on occasion in corridors, conferred at meetings, and schemed in barrooms about what could be *done* to advance the cause of interdisciplinarity. Their vaguely emerging consensus was to start a new interdisciplinary professional society—to *exclusively* emphasize interdisciplinarity. The history of the emergence of MRS, in the sequential order of who was involved, when, and what they did, is summarized in Table I. The table tells the story in a condensed form. A few annotations will embellish it.

### **Conception and Gestation: The Penn State Years**

The time line in Table I shows that the early history of MRS is deeply linked to Penn State and its MRL. The official birth, i.e., the first MRS meeting, was organized by and held at Penn State, that birth having been preceded by a six- or seven-year courtship and marriage conducted from that base. The “gleam in the eye” start for MRS began in April 1966 when I ran a major international topical conference on an obviously cross-cutting area of materials research: “Materials Characterization.” During the conference, intriguing questions emerged: Who sponsors this conference? Why not a new society? Surely the field of materials research needs help.

A year later, I raised this issue officially to Fred Seitz, then president of the National Academy of Sciences and, of course, himself a major figure in materials research. He set in motion a chain of events involving principally Nate Promisel, director of MAB (later NMAB, the National Materials Advisory Board), Bruce Hannay, a vice president at Bell Labs, and myself. Out of the deliberations of a high-level committee of industry and government (and university) administrators appointed by Seitz, it became clear that the two separate actions we had long mooted could be taken—the formation of a Federation of Materials Societies (FMS) and the establishment of a new society. But the National Academy itself declined to play any role in the matter.

At ICCM-II (Second International Conference on Characterization of Materials), held in 1968 in Rochester, NY, a new society, in response to the questionnaires I handed out to attendees, was favored by a 3:1 margin. Immediately after the conference, however, senior agency officials informed me that they were not in favor of such a move. In May 1968 (as a delegate from the American Chemical Society), I raised the issue officially at the National Research Council meeting. Nate Promisel interpreted the response as a green light, and proceeded to start FMS.

By April 1969 the time was ripe and, at the First National Colloquy on Materials (which, in addition to surveying the status of research, focused on all such issues of the organization of the field), key directions were set during a breakfast meeting held on the last day. From that meeting, which involved both the key agency supporters and the activists, emerged the decisions on the COSMAT study of the field, and support for both a new society and a federation of existing societies.

From that point onwards, the core group of organizers of the Society—Eric Bauer of Case Western Reserve University, Harry Gatos of MIT, N.

#### **JULY 10, 1970**

Three efforts proceeding in parallel: COSMAT study (Baker, M. Cohen), FMS (Promisel), and “AMS, MSES, MRS” Society.

Report by Myers and Roy summarizes status and real scope of future MRS.

#### **NOVEMBER 11, 1970**

Constitution of MRS mailed to councillors with a letter from Myers.

#### **MAY 4, 1971**

First meeting of FMS Steering Committee.

#### **AUGUST 6, 1971**

Founding Committee outlines nature of possible future meetings of MRS.

“MRS” Founding Committee expanded, adding E. Banks (Brooklyn Polytechnique), K. Jackson (Bell Labs), E. Kay (IBM), R. Laudise (Bell Labs), S. Sprague (Celanese), R. Stein (U. Mass.), J. Tietjen (RCA), and S. Sternstein (RPI).

#### **AUGUST 11, 1971**

Weisberg (treasurer) asks for \$50 from each Founding Committee member to nucleate treasury.

Founding Committee meets at Penn State. Myers elected secretary.

Invitation to join MRS mailed to initial group (500?); potential topics for meetings discussed.

#### **MAY 1972**

First conference held to address this aspect of early IDMRL vision. E. David, Science Advisor to President Nixon, and senior industry/university materials research leaders attend.

National Conference on University-Industry Coupling. Roy is organizer and chair.

#### **FALL 1972**

Topic of Phase Transitions selected for first MRS meeting.

ONR support for first MRS conference obtained by Penn State.

#### **JANUARY 26, 1973**

Membership building slowly.

Myers reports 115 members signed up; 4,000 conference invitations mailed.

#### **MAY 23–25, 1973**

**First National Meeting of Materials Research Society.** L.E. Cross (Penn State) chairs the Program Committee, Roy organizes and opens the conference, and E.M. Hawk (Penn State) manages the conference.

215 members from a total of 275 attend. Profile shows 33% trained in chemistry/chemical engineering and 33% in materials (ceramics, polymers, and metals). First official business meeting of MRS: Gatos, president; Roy, vice president; Myers, secretary; E. Parker (Berkeley), S.V. Radcliffe (CWRU), and S. Sternstein (RPI) added to Founding Committee.

**May 23-25, 1973 (continued)**

MRS-HQ: 102 Materials Research Laboratory, University Park, Pennsylvania.

**MAY 1974**

Unofficial newsletter mailed (Myers, editor). Efforts made to involve a wider circle: Hold meeting near Bell Labs and Boston.

First elected officers and council of MRS shown in highlighted area below.

**MARCH 24-25, 1975**

Second annual MRS meeting (no meeting held in 1974).

Conference on defect-property relationships, Princeton, NJ. W. Bottoms, J. Wernick (co-chairs).

**JUNE 5, 1975**

Responsibility for local meetings transferred to A. Tarpinian at Watertown.

First Council meeting. Roy (president), Jackson (vice president), and Bottoms (secretary).

**AUGUST 27, 1975**

Key concept of several simultaneous topical meetings designed.

Letter to Council from Jackson, Program Committee Chair.

**SEPTEMBER 12, 1975**

Planning for 1976.

Council meeting at Bell Labs. Letter to Council from Jackson.

**MAY 1976**

Third conference planned with six topical sessions. Call for Papers issued for MRS-76.

**NOVEMBER 15-17, 1976**

MRS annual Boston meeting established.

**1977**

MRS-HQ returns to MRL, Penn State.

Regular pattern set: Select topics, find new chairs, maintain breadth, and stay at frontier.

**NOVEMBER 1977**

Von Hippel Award named for and received by Arthur R. von Hippel.

**1978**

Annual meetings continue at Boston.

Increase in attendance due to symposia on radioactive waste management and laser-solid interactions.

Bruce Hannay of Bell Labs, Rod Hanneman of GE, Mark Myers of Xerox, I. Warshaw of NSF, and L. Weisberg of RCA, with me as convener—continued the four-year-long process of actually putting in place a new society. Keeping up the pressure for the epistemic and organizational necessity and value of a new society required a mixture of strategic planning in committee meetings and nationally visible conferences (for example, on university-industry coupling in materials). Constitutions were drafted, dozens of names and logos were examined, and financing for meetings in a not-too-receptive climate in Washington had to be managed.

Finally, MRS was born: The inaugural meeting of the Society was held at Penn State on May 23, 1973. The theme was a perfect cross-cutting topic: Phase Transitions. We took great pains to arrange sessions to demonstrate the three-dimensional nature of the interdisciplinarity MRS sought to highlight: across disciplines, from basic to applied, and across institutions. Probably just under 300 people, including Penn State faculty and students, attended; 215 had signed up to become members.

But the battle to establish MRS as a viable infant was just beginning. The next four years would prove still to be a struggle. Penn State's MRL had carried most of the organizational costs to this point. Attempts were made to spread the burden of editing the newsletter (Myers and Warshaw, in turn), of being secretary (Myers, and Bottoms at Princeton), of organizing the meeting (Bottoms, then Gatos at Boston). Mark Myers (now executive vice president of Xerox), Izzy Warshaw (head of materials at the National Science Foundation), Harry Gatos, and Ken Jackson assumed major roles. I assigned my colleague Ernie Hawk as the staff person for MRS, a role in which he earned the gratitude and respect of all our early presidents (as recorded by several in their recollections). After a two- to three-year experiment in separating the local meetings management (to Aram Tarpinian at the Watertown Arsenal), MRS headquarters returned to Penn State in 1977-78.

The guiding leadership kept close to the core ideas and ideals of the Society. By mixing the drawing card of the problem-focused symposia with the centripetal sessions on education and reviews, and with general plenaries, we hoped to create a self-conscious advocacy group for *interdisciplinary materials research*. Thus, in selecting Arthur R. von Hippel as the archetypal interdisciplinary model, the Society was recognizing greatness which had previously gone unrecognized because it was so obviously out of the disciplinary rut. The conditions for awarding the Von Hippel prize clearly spell out this emphasis on interdisciplinarity—a parameter which still describes the Society most distinctively.

From 1978-85, the annual meeting took off in number and variety of symposia and in attendance. The succession of presidents of that era, who all came from two or three industries and two or three national labs—Ken Jackson, Rudie Voorhoeve, and John Poate (Bell Labs), King Tu (IBM), Clyde Northrup (Sandia National Labs), Harry Leamy (Bell Labs), Woody White (ORNL), Elton Kaufmann (Lawrence Livermore), etc.—gave extremely generously of their time and energy.

When the number of members had passed 1,200, the effort of managing the Society went off the scale for a bootlegged operation at a university MRL, staffed by a half-time Ernie Hawk (even when aided by his wife, Jean.) It became clear that new staff members were essential. Three options were considered, and I agreed with the leadership that it was time to send the young Society out on its own and sever that umbilical institutional linkage to its parents at Penn State. The nucleation phase of MRS had to move into the growth phase, governed by new equations.

*Rustum Roy is Evan Pugh Professor of the Solid State at Pennsylvania State University, and was president of MRS in 1977.*

**MRS FIRST ELECTION**

Slate of officers and councillors proposed and approved for the Society in 1974

**President:** Harry Gatos, MIT

**Vice President:** Rustum Roy, Pennsylvania State University

**Secretary:** Mark Myers, Xerox Corporation

**Treasurer:** Leonard Weisberg, Itek Corporation

**Newsletter Editor:** Israel Warshaw, National Science Foundation

**Councillors (one-year terms):**

E. Baer, Case Western Reserve University

R. Huggins, Stanford University

E. Kay, IBM Corporation

E. Parker, University of California-Berkeley

K. Jackson, Bell Telephone Laboratories

**Councillors (two-year terms):**

J. Tietjen, RCA Laboratories

E. Petrie, Eastman Kodak Company

R. Stein, University of Massachusetts

S. Radcliffe, Case Western Reserve University

R. Laudise, Bell Telephone Laboratories