The Future of The Black Rock Forest

A Report of

The E. G. Stillman Forest Committee

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by the Committee

E.H. Ahrens, Jr., M.D.

George W.S. Trow, Jr.

Summary

A history of the work done at the Black Rock Forest would reveal three periods: a period of unity of purpose; then, a period of a split sense of purpose; and a period (coming down to the present moment) of a radically split sense of purpose. Harvard abandoned the original mission but did not substitute a new one. Harvard's statements about the Forest show this "split" and unsureness about what it wants to be doing in silviculture.

Insofar as Harvard's actions have any basis in thought or public discussion, they have a basis in the Wilson Report of 1973 which says that "Few things could be done here [at BRF] that could not also be done at ... Petersham" and that "Because of its shallow, stony soils, it [BRF] would never become a productive forest in terms of timber management."

The Ernest G. Stillman Forest Committee raises the issue of redefining the mission of the Forest. A beginning is found in BRF Bulletin No. 1 which defines the BRF as a forest laboratory for research in problems of forest management and for demonstration of successful methods in practice. The Committee proposes to answer these questions: 1) Is it possible and desirable to carry out this mission now? 2) If so, can the BRF be structured so that other elements can be added? 3) What funds are needed and where will they come from?

The Committee feels that the New York State Forest Resources Assessment Reports demonstrate that such a forest

laboratory should exist. The Committee cites evidence given by a consulting forester, Starling Childs, as to the health, quality and type of timber now standing in the BRF and concludes that the BRF can be a productive forest in terms of timber management. The Committee cites discussions with Dr. Peter Raven, Director of the Missouri Botanical Garden, who outlines a structure for the Forest: "You can be independent and cooperative, both."

The Committee, considering especially the opinions of Dr. Raven, finds that the Forest needs a diverse Board of Trustees, and a well-focussed operation deriving from a three-year Planning Period and the development of a detailed Forest Plan.

The Committee outlines a plan by which an endowment of $2,000,000 - to be permanently attached to the Forest - may be raised. One half (50%) of the BRF Trust Fund will be required.

Scope of the Report

Presented with a number of difficult but interesting problems related to the future of the Forest, the Ernest Stillman Forest Committee has sought to find the best possible information, available now, which can be of use, now, in determining the future of the Black Rock Forest.

The Committee has identified three sources of information and opinion that should be of particular interest, we think, to anyone interested in the future of the BRF.

In addition, we endeavor to provide, in brief, a sense of the historical context in which the problem of the future of the Forest (and the new information we are beginning to develop) should be considered.

Finally, we suggest a new Program for the Black Rock Forest, and a note on finances.

The Ernest G. Stillman Forest Committee

The Ernest Stillman Forest Committee was formed by two men with an interest in silviculture. They are E. H. Ahrens, Jr., M.D. of Rockefeller University, and George W.S. Trow, Jr, a journalist. Dr. Ahrens knew Dr. Ernest Stillman as a colleague at Rockefeller University. George Trow is the recipient, this year, of the Jean Stein Award of the American Academy - Institute of Arts and Letters in part for his essay "Annals of Discourse: The Harvard Black Rock Forest".

The Board of Advisors is:

Terence Monmaney
Science '85; Washington, D.C.

Rev. Frederick Q. Shafer
Bard College; Annandale-on-Hudson, New York

Whit Stillman
New York, N.Y.

Stephan Wilkinson
Cornwall-on-Hudson, N.Y.

The Problem

In one sense, there is no problem. New York is a forest state; 60 per cent of New York is forest land.[1] And much of this forested land (cleared in the 19th Century,) is "returning to a condition of high enough quality and volume to justify intensive management."[2] We notice that two predictions made by Ernest Stillman in his memorandum of 1940, "Random Thoughts on the Harvard Forest" are noted by the New York State Forest Resources Assessment as important new facts: there has been a shift from urban to rural population growth[3]; wood is now an important source of fuel in New York.[4] In BRF Bulletin No. 1 (1930) R.T. Fisher, Director of the Harvard Forest wrote:

> The Black Rock Forest...is probably the first institution of its kind to be established in the United States - a private property organized as a forest laboratory for research in problems of forest management and for demonstration of successful methods in practice. In carrying out this purpose, for which a great deal of the preliminary work is already done, the Forest has every prospect of rendering a valuable public service.[5]

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1. New York State Forest Resources Assessment-Report No. 1 p. 52 (1980)
2. New York State Forest Resources Assessment-Report No. 2 p. 26 (1983)
3. New York State Forest Resources Assessment-Report No. 5 p. 10 (1980)
4. Ibid. p. 45
5. The Black Rock Forest Bulletin No. 1 p. ix (1930)

The situation, from the point of view of a citizen of New York State interested in her forests, is more clear now than then: as the forests of the state mature and "return to a condition of high enough quality and volume to justify intensive management," the Black Rock Forest has every propsect of rendering a valuable public service. The Forest would seem to be especially blessed. It has a large endowment of money; as to location, it is poised between rural counties needing to learn what it can teach and the greatest population center in this country.

And yet all of us are in agreement that the Black Rock Forest is lacking in a sense of mission; it has not much to show, at the moment, for all its advantages.

Work History

The outlines of the history of the BRF and the Black Rock Forest Trust are known to anyone likely to be reading this report. It is not necessary to reproduce them here. Still, there are issues touching on the nature of the work that has gone on in the past which need to be considered in order to understand how it is that we find the BRF almost "dead in the water" at this moment; these issues will need to be resolved before we can successfully address the question of the Forest's future.

The Committee takes note of these facts:

1. The work undertaken at the BRF while the Forest was owned by Ernest Stillman is well documented.

The fourteen "Bulletins" published by the BRF in the period 1930-1949 total more than 1000 pages. The two "Progress Reports", the ten-year (issued in 1939), and the twenty-year (issued in 1949), are particularly valuable records. As Professor Ernest Gould of the Harvard Forest, Petersham, writes in his submission to the New York Attorney General's office (1/23/85): "The vigor with which Dr. Stillman pushed the program of silvicultural experiments can be seen on the map which accompanied the first 10 year progress report. It is apparent that cutting of one kind or another and/or planting spread over about 60 per cent of the forest". The map accompanying Professor Gould's submission is a reduction of the 1939 Progress Report map.[6]

2. The work done by Harvard at the BRF is much less well documented. From this period now ending (perhaps) we have one Bulletin and no "Progress Report" of the type issued by the Stillman Forest.

3. The Stillman Bulletins, particularly the "Progress Reports", are rich in theoretical and historical discussion: dialogue concerning the mission and purpose of the BRF was considered an integral part of the work.

4. Evidence of theoretical and/or historical discussion during the Harvard years is spotty and sparse. After 1949 almost no discussion of the mission of the BRF occurs.

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6. Exhibit "A" : Synopsis of Activities at the Black Rock Forest; Harvard University to Attorney General's office 1/85

5. Nonetheless, a change in mission can be discerned in the work of the Forest in Harvard's years.

A model of what an intelligent theoretical-historical discussion can be is Dr. Peter H. Raven's paper "Research in Botanical Gardens" (1981). Dr. Raven is the director of the Missouri Botanical Garden, and the most eminent plant biologist now working in this country. Dr. Raven has achieved an unusual and productive balance: on the one hand he works within the framework of an institution established in the 19th century; on the other he superintends research in tropical silviculture - work not envisioned by the founders of his institution. For this reason, perhaps, he is sensitive to the role of the framework - the institution - in determining the nature and quality of the work done within the framework - the institution. A discussion of mission and purpose (why are we doing this? and who are we?) is integral to Dr. Raven's published work - as it was to the published work of the men working at the BRF in Ernest Stillman's day - and so is the conviction that a sense of history can enliven work in the present because it keeps alive the framework within which the work is being done.

Dr. Raven understands that the history of individual human beings determines what scientific work gets done since the history of institutions is the story of certain individuals - what they do; what they fail to do; Of important botanical collections he says:

> Unfortunately, such collections are often dismantled or simply deteriorate after the specialists who built them up are no longer

> active at the respective institutions (Poppendieck 1979). Although they are often of very great value internationally, they may if they are not actively utilized come to be viewed as a drain upon the limited resources of the institution where they are housed. Even when financial considerations are not limiting, it is difficult to provide for such collections the meticulous and sustained care that is essential for their survival without the attention of a specialist who is deeply concerned for them.[7]

The Committee wants to say here (before we return to a brief description of the Forest during Harvard's tenure) that we feel that the moment calls out for intelligent consideration of the Demonstration Forest (and this is what the BRF was set up as) of the kind Dr. Raven has given to the botanical garden.

There was no "Progress Report" issued in 1959 to mark the 30th year of the experiment. Coincidentally, however, Dr. Hugh Raup, then Director of the Harvard Forest in Petersham, wrote a four-page letter or report in July of that year to John Stillman, a son of Dr. Ernest Stillman who had raised inquiries about the seeming lack of work in the BRF. The timing of the letter or report coincided with the retirement of Ben Stout, the man who had been running the BRF[8]. Dr. Raup summed up recent work:

> When I look back over the whole period of Ben's tenure at Black Rock I sense a certain

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7. Raven, Peter H. "Research in botanical gardens" Bot. Jahrb. Syst. Stuttgart, 1981 p. 56

8. Mr. Stout was not the "Director" of the BRF. The Forest has not had a "Director" since 1949.

> ammount of "completeness" in it. The road net has been brought forward to about where it should be to make most of the Forest operable; the research and operational record system is commensurate with the one we are using here, is up to date, and is running smoothly; a new set of thinning and regeneration experiments has been put in on a very considerable scale, heavy thinnings that are complementary to the light thinnings that Hal Tryon had put in earlier; the Forest's public relations are reasonably good and look as though they could be kept so. It would be possible, of course, to go on putting in more experiments in the manipulation of the stands of trees - long-term experiments. However, such experiments, as we know from experience here at the Harvard Forest, involve a lien on future time and resources, and we start them only sparingly and after a great deal of thought and consideration. We could properly stop this kind of operation for a period of years, and watch the results of the experiments accumulate.[9]

We have here a picture of an operation that is pulling back its horns: the high priority is maintenance, the road-network and record-keeping; the low priority is to "long-term experiments" which would involve "a lien on future time and resources." And whatever work was going on in the Forest, very little word was getting <u>out</u> of the Forest; so much so that a man personally interested in the work of the Forest had to request a private report.[10]

And now we discover that we do have a "problem." For the whole period of Harvard's stewardship we have statements

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9. Report to John Stillman from Hugh Raup 7/59 pp 2-3

10. For comparison: the ten-year "Progress Report" was 76 pages, illustrated with photographs and included a large map. The twenty-year report was 89 pages and illustrated.

that everything is going according to plan;[11] Dr. Gould's Synopsis of January, 1985 concludes:

> This silvicultural work continues by people at the Harvard Forest and at the Black Rock Forest. A careful review of the more than 600 publications jointly produced shows how the resources set up by Dr. Stillman have been used at both institutions to pursue their common goals of research, demonstration and teaching.[12]

And yet, during this period, aspect after aspect of the Forest's work fell away. It would seem to be the kind of split situation that emerges when no sense of purpose is present and where the vocabulary necessary to discuss purpose is absent too. Peter Raven has caught the essence of it when he writes of botanical gardens that if they are not actively utilized they may come to be viewed "as a drain upon the limited resources of the institution where they are housed."

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11. Raup's 1959 report to John Stillman goes so far as to say: "...we could well be at a turning point in the general research program at Black Rock." p. 3

12. Dr. Gould's Synopsis is not illuminating when it mentions "the more than 600 publications jointly produced," since that phrase masks the enormous fall-off in major studies coming out of the BRF during the Harvard period. The Committee has 11 Bulletins from the Stillman period, a total of 960 pages; three out-of-print Bulletins bring the total well over 1000. The one Bulletin of the Harvard period is 45 pages.

Up to the Present

The Black Rock Forest was established as a Demonstration Forest. We quote from BRF Bulletin No. 1:

> The Black Rock Forest, from which this bulletin is the first publication, is probably the first institution of its kind to be established in the United States - a private property organized as a forest laboratory for research in problems of forest management and for the demonstration of successful methods in practice.[13]

As we say above, the EGS Forest Committee feels strongly that there is a need for good and deep consideration of the history of the mission of the demonstration forest - on the model of Dr. Raven's paper "Research in botanical gardens."[14] We cannot meet this need in this report - only point it out. Nonetheless we feel that we have identified three periods in the history of the work of the BRF. They are:

1. A period of unity of purpose.

   During this period (ending in 1949), scientific work, practical work, and the work of demonstration (and publication) went on in a unified framework. There was a sense that none of these aspects of the work could be dropped without damaging the undertaking as a whole.

2. A period of split purpose.

   During this period (characterized by Dr. Raup's 1959 report to John Stillman,) work went on in the BRF on a reduced scale; the work carried out

13. The Black Rock Forest Bulletin No. 1 p. ix (emphasis added)
14. Excerpts from this paper are given in Appendix A

was in line with earlier work, and there was no overt change in mission; and yet crucial parts of the work fell away. In particular, the work of demonstration and publication came almost to a standstill, so that while the methods of work and the silvicultural theories behind the work were still in place, the over-all sense of purpose was lost. Perhaps abandoned would be a better word.

3. A period of radically split purpose.

In this period (which brings us up to the present,) because the sense of over-all purpose had been lost (or abandoned) some years before, the specifics of the work (its theories and methods) began to seem futile. We enter the phase described by Dr. Raven in which entities like botanical gardens and demonstration forests "come to be viewed as a drain upon the limited resources of the institution where they are housed." It is characteristic, that while the unity of purpose which was present at the start has been lost, no new unifying idea or purpose is brought forward. In this period, in the instance we are discussing, the split is radical. "The work continues," as Dr. Gould wrote in his report submitted in January, 1985, "by people at the Harvard Forest and at the Black Rock Forest. A careful review ... shows how the resources set up by Dr. Stillman have been used at both institutions to pursue their common goals of research, demonstration and teaching." [15] One might almost forget that Harvard is proposing to sell the Harvard Black Rock Forest.

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15. Exhibit "A" : Synopsis of Activities at the Black Rock Forest; Harvard University to Attorney General's office 1/85 p. 3

Dr. Ernest Stillman was a citizen of New York State. Implicit in the mission of the BRF as he conceived it were important local and regional benefits. He wrote in his memorandum: "Random Thoughts on the Harvard Forest" :

> "... I believe an intensive study of how to grow most rapidly the most valuable local species of trees on the soil available would accomplish the most good."[16.]

It is important to note that as the sense of mission was lost, and as the aspects of demonstration were de-emphasized and then denigrated, important benefits were denied to the people of our state.

Where We Are Now

We have said that Harvard, throughout the period of its stewardship (right up until Dr. Gould's report of January of this year), has paid lip-service to the science of silviculture; yet we have also said, just above, that it has denigrated the demonstration and practical forestry aspects of silvicultural work which are, of course, central to the raison d'etre of its two demonstration forests: The Harvard Forest at Petersham, Mass. and the Black Rock Forest.

Now we have to consider the Wilson Report of January, 1973. Again, since the history of this report will be known to anyone likely to be reading this one now, we will not

16. "Random Thoughts on the Harvard Forest" - Dr. Ernest G. Stillman. (1940) p. 6. Reference is to BRF

discuss it at length. But we should note that it is the only public document we know of in which Harvard makes known its negative attitude toward the BRF. The report was of course made to the University, but since it was released to the press by the University News Office, it can be said to be of the University as well.

Relevant portions include these remarks:

> In terms of the lasting and important scientific contribution of forestry research on the Forest, it appears that it has been modest in both quantity and quality although the best of it has been very good. Very little research of any sort has been done in the past ten years. The last Bulletin, on root systems of deciduous trees, was published in 1957. Recent issues of the Papers have been mostly on the recreational potential or use of the forest. This has been consistent with the increasing demand for the Forest as recreational ground and open space.[17]

> Indeed, it appears to us that the potential for forest or botanical research in this area is extremely limited. Few things could be done here that could not also be done at the Harvard Forest in Petersham. The vegetational complex at the Black Rock Forest is not unique although it is a good example of what happens to a forest area in the East that has been used and abused for several hundred years. Because of its shallow, stony soils, it would never become a productive forest in terms of timber management.[18]

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17. Report by Crompton, Reifsnyder and Wilson to Harvard; Released by University News Office 1/18/73 pp 6-7.

18. Ibid. p 7.

Crompton, Reifsnyder and Wilson recommended that a new committee be formed "to consider the future of the Black Rock Forest as well as the use of endowed funds intended to maintain the Black Rock Forest." [19]

No such committee was formed (or if it was formed, the results of its deliberations were not released into the public record,) and we can only assume that Harvard has looked to the findings of the Wilson group as it has sought to find its way in the BRF issue.

And yet there are other confusions. In October, 1979, John Stillman came away from a meeting with Dean Leahy with the impression that "Harvard's chief motivation for its willingness, if not anxiousness, to sell Black Rock Forest is budgetary."[19] And the writer of this report on a visit to Cambridge in 1981 found that Dean Leahy and Harvard's general counsel were unable to pin-point a moment in which Harvard began to be dissatisfied with the BRF. An enormous mist of confusion hangs over the issue. Is Harvard interested in silviculture at all? If Harvard is interested in silviculture, what deficits exist at BRF that make it desirable to continue work at the Petersham facility but not the BRF? Is it really a matter of "stony soils"[20] (as the Wilson Report suggests?)

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19. John Stillman to Daniel Steiner 10/27/79 p. 1
20. Leahy suggested in a meeting with this writer that "heavy glaciation" had produced a soil condition that made silvicultural work in the BRF unprofitable. cf The New Yorker 6/11/84 p 84. The poor conditon of the soils was, of course, a given of the BRF experiment. C.S. Denny's study of "Glacial Geology of the Black Rock Forest" (Bulletin No. 8) was issued in 1938.

or that "The vegetational complex at the Black Rock Forest is not unique"[21] or that "Few things could be done here that could not also be done at the Harvard Forest in Petersham"?[22] If there are such deficits, why haven't they been analyzed in detail? When did they begin to be obvious? Or interfere with the work? Why does Harvard continue to issue such statements as: "A careful review... shows how the resources set up by Dr. Stillman have been used at both institutions to pursue their common goals of research, demonstration and teaching" which make no mention of any shortcomings or disappointments? Why didn't Harvard set up the "new committee" which is called for by Crompton, Reifsnyder and Wilson?[23]

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21. Wilson Report p 7

22. Ibid. p 7 It is interesting to remember that in 1940, at the time the BRF Trust Fund was being set up, Hugh Raup wrote: "One of the most important features of The Black Rock Forest as a prospective part of the Harvard Forest organization is that it would materially broaden the field for research in hardwood management. It would also afford a wider range of possibilities in teaching and research in general Biology. Black Rock is in the oak region so far as upland hardwoods are concerned, whereas we have a strong element of northern hardwoods in Petersham." - Random Thoughts on the Harvard Forest p 7; footnote 8.

    At least one observer finds that Petersham has the deficit. Starling Childs writes: "None of the stands we encountered at Petersham can boast a history of careful planning and management for optimum returns such as one finds at the Black Rock Forest." cf Childs Report.

23. Wilson Report p 16.

Where We Are Now - In The Black Rock Forest?

One would expect that when an institution ventured into uncharted waters that it would do so only after careful deliberation and study. It is a first conclusion of this Committee:

1. That Harvard did not enter upon its present course after careful plan and study.

But that:

2. Since the affiliation has not been productive for the Forest, for the people of New York State or for the University - it ought to be brought to an end.

Since this Committee felt that the fundamental problem was a lack of a sense of mission, the lack of unity of purpose, we went back to the definition in the first Bulletin. We assume that the Black Rock Forest is now, as it was in 1930:

"... a forest laboratory for research in problems of forest management and for demonstration of successful methods in practice."

We assume that the job of this moment is to determine:

1. If it is possible (and desirable) to carry out this mission now.

2. If it is possible to structure the operation in such a way that other elements might be added to this

mission.

3. What funds are needed; and where will they come from?

We begin by noting that it may not be desirable for an institution interested only in "research" to carry out the mission articulated in Bulletin No. 1. Any citizen of New York State who has read the New York State Forest Resources Assessment Reports will I think conclude, however, that it is desirable that this mission be carried out now.

We have now to deal with the question: can it be done?

Here we have to consider the statement in the Wilson Report that: "Because of its shallow, stony soils, it would never become a productive forest in terms of timber management."[24] Is it true that the BRF can "never become a productive forest in terms of timber management?"

The Childs Report

The Stillman Forest Committee asked Starling W. Childs II a consulting forester (Master of Forest Science -Yale) to visit the BRF and prepare a report for us. We went to Mr. Childs not only because of his professional expertise but because the Childs family runs the only operation known to the Committee which can be directly compared to the BRF - the Great Mountain Forest in Norfolk, Connecticut. The Great Mountain Forest is a tract of 6,500 acres in North-

24. Wilson report p 7

western Connecticut and has a history that parallels the history of the Black Rock Forest in many ways. It is reclaimed land - reclaimed from overcutting for charcoal at the turn of the century. It was set aside for reclamation with an eye to public benefit. At first it was intended as a wildlife preserve. In the next generation the Childs family saw the need for timber stand improvement. At this date it managed for wildlife, for recreation, for preservation of unique natural areas - and for improvement of the timber stand. It runs at a profit.

The Childs report is included as an appendix to this report. We will, however, discuss some of it here. First of all we say that anyone interested in coming up with a good future for BRF must look at the Childs' experience at the Great Mountain Forest. Second, we note that the Great Mountain Forest had a strong connection to Yale until 1968. The connection came about because the Yale forest in eastern Connecticut suffered the same kind of severe damage that Harvard suffered in Petersham in the 1938 hurricane. What we want to note is that the Great Mountain Forest is thriving today and sending out new shoots despite the fact that Yale abandoned its summer camp in GMF in 1968. The lesson seems to be that the optimum arrangement for an entity like GMF or BRF is stable private management with institutional affiliations as they seem appropriate to both parties.

When Starling Childs came into the BRF he expressed

surprise at the overall health and condition of the Forest. There are two schools of thought about conservative forestry. One school holds that there is no point planning too far ahead in the future; one can't plan against catastrophes. This point of view, which gained impetus from the 1938 hurricane, can be seen in some of thepapers published by Ernest Gould at the Harvard Forest, for instance. The debate goes on in theory and in "simulations". The fact is that the 1938 hurricane didn't damage the BRF to any great extent. And there are aspects of health and utility now visible in the BRF which one would not thought to have predicted. And a bonus: Starling Childs was amazed at the quantity and quality of many of the BRF's stands of red oak. Red oak, which was not a tree highly prized at the time the BRF was first got underway, is now a valuable tree. It is used in veneers (the GMF deals in veneers for the export market) and in interior decoration. It appears that the BRF can indeed be "a productive forest in terms of timber management."

Mr. Childs writes:

> Considering the present high demand situation for both fuelwood and biomass as well as the high prices paid for quality Oak veneer and sawlogs, one might conclude that Dr. Stillman possessed some powers of marketplace clairvoyance with respect to our regional forest resources[25]

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25. Childs Report to EGSFC p 1

To summarize: we feel that we have a good beginning definition of the BRF's mission in the Foreward to the first Bulletin. The BRF is: a forest laboratory for research in problems of forest management and for demonstration of successful methods in practice.

We feel that the New York State Forest Resources Assessment Reports give us ample reason for saying that such a forest laboratory should exist.

And we feel that the Childs Report to the EGSFC gives us good reason to think that the Black Rock Forest can be "a productive forest in terms of timber management.

Now we move to Point 2 above: Is it possible to structure the operation in such a way that other elements might be added to this mission?

The Committee met with Peter Raven, the Director of the Missouri Botanical Garden. Dr. Raven's position is, we feel, unqiue, and uniquely useful to those of us who are trying to find a way to a good future for the BRF. He is the head of an old institution with an "old" mission embedded in the context of a metropolitan area with problems old and new. He has to consider the day-to-day realities of the context he is in; at the same time his adventurous research work has given him an international reputation. At the same time he has considered how the structure of an undertaking will always affect the achievement (or non-achievement) of its goals.

The Committee feels that it has identified three sources of information which must be taken under consideration by anyone beginning to plan the future of the Black Rock Forest:

1. To re-establish contact with the original mission (and sense of mission) of the BRF: The Ten-Year and the Twenty-Year "Progress Reports." (BRF Bulletin No. 10 and BRF Bulletin No. 14)

2. To re-discover how the BRF can be "a productive forest in terms of timber management" : the experience of the Great Mountain Forest in Norfolk, Connecticut.

3. To create a structure which will allow the "old" mission of the BRF to be realized and "new" work to begin: the recommendations of Dr. Raven.

Dr. Raven is familiar with the history of the BRF. In particular, we asked him to consider the question of structure and funding. We suggested the goal stated above:

to realize the "old" mission of the Forest - and to allow new work to begin.

Here are his thoughts and recommendations:

Thoughts on the future of the Black Rock Forest

Peter H. Raven, Director, Missouri Botanical Garden

"I will say this over and over again - avoid thinking about how big it can be how quickly. It is far more important to think about how persistent can it be - a steady state which can be of value to many different kinds of people over a very long period of time.

"You can't be in puberty about the whole thing; I mean you do not want to be in a situation where it has to take off or not almost immediately. A consortium set-up with small ammounts of money can create that kind of pressure: you perform right away or everyone loses faith. That is a danger: a small time period and pressure to produce.

"It doesn't have to take off immediately. Keep it steady enough so you're all right.

"If you have a set-up which produces high expectations for results and high pressure, you have a high possibility for not succeeding.

"As to staff. What you want is the situation you have now providing basic maintenance plus one really first-rate person. Really a lot depends on that. One way to conceive it is a term appointment for that person: 'Will you come for three years; then will you tell us the best use of the Forest?'

"You want to find a first-rate theoretically-inclined

person. He or she should be telling you these things: 1) The needs of silviculture; 2) The needs of the area; 3) Any additional possibilities.

"The person who does the planning does not have to be the permanent Forester.

"To put it another way; you want to consider during this period:

1) What can be done that will be unique?
2) What can be done that will be useful to the area - not excluding recreational use.
3) What can be done there that is valuable and worthwhile . This may not turn out to be the same thing as what is unique.

"One thing this person should investigate is funding. Managing the forest to yield a profit can be part of a funding plan. Endowment income to cover the basic costs - maintenance at the current level, plus the cost of the Manager we envision plus some manipulation - that should be your base. After that, profits from management of the Forest can be a factor; and other funding sources.

"Now, we begin to think about linkage to an institution. Here our experience can be of use to you.

"My idea is colored by experience at the MBG. We were founded in 1859 - about the same time as Washington University in St. Louis. The school of Botany at Washington University was founded by

Henry Shaw, the founder of our Garden. By custom the Director of the Missouri Botanical Garden is also Professor of Botany at W.U. One quarter of the salary of the Professor is paid by the University. Here is an almost ideal arrangement. One can imagine something similar for BRF.

"There needs to be a institution of higher education related to it somehow. The N.Y. Botanical Garden suffers from not having a good academic connection.

"Its <u>own</u> endowment

"Its <u>own</u> management

"<u>Then</u> a link with an institution. That's what we've got. We don't give degrees.

"The man or woman in charge has to be a forester; <u>not</u> a plant physiologist; not an experimental scientist. He studies the growth, measures the trees, manages, <u>thinks</u>.

"If you could get $2,000,000 you could have a breathing space - it could be an indefinite breathing space. You don't have to go beyond this point if you have the right person. At this level of funding, a consortium could be a huge mistake. It can be a good arrangement, but it is very difficult to put together. You have to have a clear view: what you will permit, what you will undertake, how intensively, for how long. Will you let the public in - on what conditions? Each member might have a different idea. You have to know

these things in detail before you go into it. I'm worried and rather negative to the whole idea. The principle here ought to be: you have to have something first. Theoretically, a consortium can be a good idea: a variety of interesting uses; but you have to have something first. It does need to be thought out closely.

"I think it is premature to think of many institutions getting involved. I think what you want to do is get it on its own bottom at whatever level - and $100,000 a year is minimum I would say - with one bright individual staff person running it and thinking it, this on top of the situations you have now - maintenance and part-time forestry crew - and then I think the best connection is with one other institution.

"One more thought on the Consortium. It's the tragedy of the communes - or the communal icebox shared by 12 graduate students - it doesn't work. It gets filled with junk. You want one theoretically inclined smart person; and a linkage to one institution - but not until it is on the ground, not until it is running.

"You can be independent and cooperative, both."

Conclusions Reached By The Committee

1. That the BRF must regain a sense of purpose.
2. That an understanding of the BRF's original sense of purpose can be useful.
3. That the BRF can fulfill its mission as "a forest laboratory."
4. That the BRF can be "a productive forest in terms of timber management."
5. That an endowment in the range of $2,000,000 will be necessary.

Recommendations of The Committee

The Committee feels that there has been a growth in understanding on the part of everyone interested in the BRF of what can and must be accomplished here. No one interested in the BRF, we believe, will want "business as usual", now; nor will he consider a "land preservation" or "land preservation-with-recreation" or a "forever wild" solution.

The Committee feels that this is the moment for all the men and women involved in the BRF issue - including, for instance, members of the Stillman family, the men and women who have devoted their time and energy to the Golden Foundation proposal (especially, of course, Mr. William Golden), members of Scenic Hudson, and members of this committee, to urge a good solution on Harvard.

The Committee proposes that discussion go forward on this basis:

1. That there be formed a Not-For-Profit Corporation: The Stillman Black Rock Forest.
2. That the SBRF be defined as: "A forest laboratory for research in problems of forest management and for demonstration of successful methods in practice, with the understanding that this is the nucleus of the sense of mission of the Forest, and that good and rigorous thinking about the mission of the Forest must also go on.
3. That a permanent endowment of $2,000,000 - to be attached to the Forest forever - is necessary.

The Committee specifically proposes:

1. That the Board of Trustees of the deed-holding entity be a diverse body, representing men and women with an interest in silviculture and with an interest in (and concern for) the Forest Resources of the State of New York, and with an interest in (and concern for) the public interest of the people of this State, and of the Hudson Valley in particular.
2. That the operation of the Forest be put under the supervision of an experienced Forester-Planner for three years. It will be the responsibility of this man or woman to develop a detailed and well-focussed

Forest Plan. This Forester-Planner will work in consultation with the Trustees. It may be that he will remain at the Stillman Black Rock Forest after the end of the three-year Planning Period as the Director of the Forest, or it may be that the permanent Director will be a different person. In any case, the Forest should be run, in its daily work, by a "Director" - one man or woman - an experienced forester whose special talents suit him or her for this post. The Committee does not feel that many different groups can be involved (at the same time) in the day-to-day work of the Forest.

3. That Harvard University convey the Forest to the Trustees of the Stillman Black Rock Forest; that Harvard University convey fifty per cent (50%) of the book value of the BRF Trust Fund (according to its latest Treasurer's Report) to the Trustees of the SBRF at the time of the closing.

The Committee further proposes:

1. That the Board of Trustees of the Stillman Black Rock Forest consist of nine members. The Committee suggests that two (2) Trustees be drawn from the list of trustees proposed for the "Preserve" under the proposal of Mr. William Golden; that two (2) Trustees be members also of the Board of Directors of Scenic Hudson; and that one (1) Trustee be

a member of the Stillman family. The EGS Forest Committee is now preparing a list of other prominent persons who may be willing to serve.

The EGS Forest Committee proposes that an endowment of $2,000,000 be raised in the following way:

1. That one half (50%) of the book value of the BRF Trust Fund be conveyed with the Forest to the Trustees of the Stillman Black Rock Forest.

   Estimated total: $1.4 million dollars.

2. That during the Planning Period of three years the interest on this capital not be spent.

3. That during the Planning Period the basic operating costs of the Forest (estimated at $35,000 a year) be paid by a benefactor known to this committee.

4. That during the Planning Period the special planning costs be paid by a benefactor known to this committee.

5. That the two groups that have in the past made offers to assume the responsibility of the Forest-(Scenic Hudson and the Golden Foundation) each make a one-time contribution to capital of $150,000.

The Committee estimates that at the end of three years the permanent endowment of the Stillman Forest will have grown in this way:

1.4 million - Portion of Trust Fund conveyed by Harvar

.3 million - contributions to capital from Scenic Hudson and the Golden Foundation.

1.7 million

Assuming a (conservative) yield of 7.5 %. Income to be reinvested for three years:

at the end of one year:

$1,827,500

at the end of two years:

$1,964,563

at the end of three years:

$2,111,905

If the capital fund does in fact show this "surplus" over $2,000,000, this "surplus" could be transferred to a working capital fund - necessary as the Forest moves out of its Planning Period into full operation.

Appendices

CURRICULUM VITAE

Starling W. Childs II
Consulting Forester
Age: 31
Status: Married

EDUCATION:

1972-1976 Yale College; Batchelor of Science Degree in Geology and Natural Resources. Thesis topic: Ecological Inventory of the Canaan Mountain Natural Area in the Berkshire Uplands.

1978-1980 Yale University; Master of Forest Science Degree. Majored in Forest Management and Silviculture.

EMPLOYMENT:

1976-1977 New Zealand Forest Service; Field technician for the Protection Forestry Division.

1978-1979 Consultant to State of Connecticut Department of Environmental Protection. Responsible for the study of logging practices and the preparation of guidelines for Best Management Practices as required under the 1977 Clean Water Drinking Act.

1980-present Self-employed Forestry Consultant specializing in private forest land management and planning. Working primarily for the Great Mountain Forest in Norfolk, Connecticut. Preparation of standing volume inventories, timber appraisals, marking and selling sawtimber and cordwood, Christmas tree maintenance, maple syrup production, road layout and maintenance, and other general forestry services work.

PROFESSIONAL AFFILIATIONS:

Society of American Foresters since 1979, American Forestry Asociation 1984, Connecticut Forest and Park Assoc. director since 1981, Connwood, Inc. consulting foresters, director since 1980.

OTHER INTERESTS:

Hiking, camping, hunting, skiing, biking, birding, and just about any outdoor activity.

Some Thoughts on the Future and the Potential of the Black Rock Experimental Forest in the Hudson Uplands.

In his "Random Thoughts on the Harvard Forest" essay in 1941, Dr. Ernest Stillman mused on the importance of small woodlot management in the the not so distant future. His goal was to have in place at that time a working example of the successes and failures of different silvicultural regimes by which the farmers and woodland owners of our day could set a course of action within their own forested acres. Considering the present high demand situation for both fuelwood and biomass as well as the high prices paid for quality Oak veneer and sawlogs, one might conclude that Dr. Stillman possessed some powers of marketplace clairvoyance with respect to our regional forest resources. The forest that he managed and left to Harvard is today a living monument to sensible, conservative forest management which seeks to optimize the potential yield from a given acreage despite the incredible variance encountered in exposures and forest site productivity.

After only one brief day cruising various portions of the Black Rock Forest, I have formed some strong impressions on what has been going on in the forest as well as the possibilities for management in the future. My specific area of interest as a consulting forester is Oak and mixed-hardwood silviculture. Since much of the land in the region of Connecticut where I work has a history of forest use and abuse similar to that of the BRF, I am working much of the time with stands of the same age class and site index as many of those encountered in Cornwall on the Hudson. It was quite gratifying on the one hand to see the results of past wise forest practices represented by the standing volume on the BRF and know that much of the work had been documented and recorded, and yet something of a mystery to me that such a valuable educational resource had gone unutilised during my time as a student at Yale's School of Forestry. While at Yale, I enrolled in a course entitled Economics of Managing the Forest and Farm Operating Unit. Ironically, this course was taught by Ernest Gould, Director of the Harvard Forest in Petersham. All of the field work, which was regretably very litttle, was directed on the forest at Petersham. In retrospect now, I can see what a waste of time this was because most of the stands on the Petersham forest are the direct result of crisis mangement and salvage cutting in the wake of the ravages of the 1938 hurricane. None of the stands we encountered at Petersham can boast a history of careful planning and management for optimum returns such as one finds at the Black Rock Forest.

This is not to say that the whole of the BRF is demonstrative of this careful management because much of it is too poor in site quality to warrant any heroic efforts to try and produce sawtimber. Nevertheless, the area is cooperatively managed by a local Rod and Gun Club , the members of which are to be commended on their road maintenance work and efforts at stimulating wildlife cover through patch clearcuts. There is an

excellent road network established and much of this road building has been accomplished since Harvard took over the management of the forest in 1950. Because spatial location of trees with respect to roads is a major factor in computing the value for standing timber, these new roads have increased the value of the standing inventory markedly.

The oak-mixed hardwood forest type which is so prevalent on the upland soils at the BRF lends itself quite well to the production of mast for wildlife and a great deal of sprout growth for browse when stimulated by intensive patch cutting. Although much of this cutting has taken place over the past decade or so, I was not aware of any studies or published reports on the results and relative successes of the various methods of silviculture applied.

The greatest problem facing forest mangers of today is how to begin to regenerate stands which have reached maturity and insure a desired species mix in the next rotation. The primary reason for this difficulty stems from the relative over abundance of white-tailed deer on most forest units throughout the Northeast. Nevertheless, some successful regeneration cuts were noted on the Hulse Road section of the BRF, and in and of themselves, they tell a story of how to manage for proper stocking of regeneration. Whether or not the desired species mix is present is a matter for closer study and manipulation in the traditions set forth a half century ago by Henry Tryon, the first manager of the BRF. There is a great deal of information to be gleaned from these cuts which are now 20 to 30 years old, and I would imagine, others of the same sort which have occured on the Sackett Mtn. compartment. It is my understanding that these areas were under the former management of Ben Stout who has since done a great deal of research in the Allegheny forest types dealing with the same question of proper relative stocking or density levels in stands for various objectives. Ironically, I have recently learned that his daughter Susan Stout, who was most probably born while her father was managing the BRF, is on leave from the Forest Service to work on a PhD thesis at Yale. She is somewhat of a well known mathematiciacn and forest statistician in her own right, and her thesis topic will no doubt revolve around some of the same questions that are raised by these cuts of her father's and the current manager Jack Karnig. This may present an excellent opportunity to update research in these areas if the Forest Service and the faculty at Yale are interested.

In the famous Glycerine Hollow tract, I was priveleged to walk through a piece of time forgotten; to see the historic results of Tryon and Stillman's labors. Here the mix of Tulip poplar, Red oak, Ash and Sugar maple is represented by large diameter trees with tall, clear boles of veneer quality. Too often these days a stand such as this has been cut and sent to the mill before its overall ~~meaning~~ Value to Science can be appreciated. The relatively varied site demands of the species represented would make it a supreme challenge to any forester who might begin to

manipulate the stand with an eye to the next generation of trees. What was an academic exercise and experiment for Henry Tryon is today a monument to his ethical approach to and love for the science of silviculture. The relative health, wide spacing, and fine quality of the standing material lends ample support to this statement, as well as to the present choice for management which is to do nothing and let it grow.

Then what might be in store for the future of the forest? That it is an excellent laboratory for field trials in silviculture is obvious. Many of the coniferous plantations are sadly in need of work,and except for the Norway Spruce and perhaps the Larch which can compete on the ~~poor~~ hardwood sites, most of these trials should probably be terminated. Wildlife and recreational value of the forest is impressive as Dr. Stillman envisioned it would be given the proximity to the greater New York metropolitan area. The watershed of the forest is immensely important and heavily utilised by the cities of Cornwall and Highland Falls. Water yield studies and long term climatic information could be useful for the area, not to mention the importance of monitoring the pH of precipitation throughout the year. The thin soils of this upland area make for very little buffering of acid precipitation and any problems that might result would be very measurable in the many aquatic systems of the forest. Here also,there is further room for study in aquaculture and aquatic ecosystems.

Any efforts to initiate research should still be channelled through one management institution such as Harvard or a like minded charitable organization. The Stillman Endowment fund for the forest makes this a desirable place to locate one's research though I do not think the forestry community is very aware of this possibility. Perhaps a newly formed Board of Directors drawing from interested and enlightened individuals who have a feel for the sense of mission and value for the forest could authorize research grants, while the overall management of the forest could be carried out by a public spirited consulting forester with excellent credentials and references. It would seem to make sense to keep someone present at the forest as a forest technician and caretaker who could work well with the local users of the forest.

One could go on at length on the possibilities, but the first and foremost reason for the forest's existence was as a demonstration forest for applied silviculture. I know that many of my colleages could benefit from the examples on the BRF,not to mention landowners who might be interested but do not know of its existence. Associations such as the American Forestry Institute and regional Society of American Foresters chapters should hold field meetings here to see some of the mistakes and successes of their predecessors. Also, much of the recent cutting aimed at stand regeneration is, as mentioned before, of great demonstrational value, and any data stemming from these studies should be updated made available if it is not already so.

My special interest in the BRF stems from the fact the I have grown up on a working and demonstration forest in northwestern Connecticut, the similarities of the former to which are striking. Reclaimed as wasteland from the overcutting for charcoal at the turn of the century, the Great Mountain Forest, as it is called, was first intended as a wildlife preserve. The Yale Forestry School became interested in the property as a place for field work when their forest in eastern Connecticut was levelled by the same 1938 hurricane which wiped out Harvard's Petersham forest. From that time until 1968 when they abandoned the summer camp, Yale conducted forest surveys, marking trials, growth and yield exercises and countless other valuable training for students who are now themselves some of the top forestry educators and practising forestry professionals in the country. A non-profit foundation was established by my father for the purpose of dedicating certain areas and funds to long term studies in tree improvement trials and preservation of unique natural areas. On going cooperative research with the Yale Forestry School and the U.S. Forest Service is overseen and maintained by a full time forester and woods crew. Road networks have been established and the forest is under management once again in order that the 6,500 acres are able to pay for the overhead necessary to manage it. Intensive management in coniferous plantations, some dating back to 1919, seeks to maximize the potential return of clear, high quality softwood lumber that is now fetching higher prices and in the not too distant future will allow the Northeast to compete with imported lumber prices from the West coast.

The GMF like the BRF is the manifestation of the ideals of several generations. My Grandfather's interests were based more on the value of the land and the man-made ponds for wildlife and migratory waterfowl. As the forest matured, my father saw the need for management and timber stand improvement work which would concentrate the regrowth of the resource on stems of high quality and species of more desired sawtimber value. To this end several forest managers have been employed and a woods crew kept busy throughout the year. The wildlife value of the forest continues to be strong and a cooperative program with the State's Wildlife Unit to reintroduce the Wild Turkey in 1974 was enormously successful. Gradually, the health of the wild game and predator populations still improves with the arrival of the Eastern coyote, the fisher, and even occasional visits by black bear all of which were extinct or not present before in this state. These are all indicators of the relative health of the toatl forest ecosystem.

The forest is also a valuable part of the Housatonic River Watershed and with some ten man-made and natural ponds is itself a valuable resource of fresh water. With public access to educational preserves and the beach area on Tobey Pond, the recreational potential is significant. Many hiking groups use the property with permission as do cross-country skiers in winter. Today the Great Mountain Forest is being managed on the

principles of multiple use and sound forest practices to continue to demonstrate that forest land in our densely popuulated part of the country can sustain multiple yields for generations to come. To these ends, the Black Rock Forest with all its endowment and history could play an equally important role.

Respectfully submitted,

Starling W. Childs, II

May 1985

PETER H. RAVEN, Director, Missouri Botanical Garden, P. O. Box 299, St. Louis, MO 63166 (1971-) and Engelmann Professor of Botany, Washington University, St. Louis; Adjunct Professor of Biology, St. Louis University; and Adjunct Professor of Biology, University of Missouri-St. Louis.

Born, Shanghai, China, June 13, 1936, married, four children.

A.B. (highest honors), University of California, Berkeley, 1957.

Ph.D., University of California, Los Angeles, 1960.

National Science Foundation Postdoctoral Fellow at British Museum (Natural History), 1960-61.
Taxonomist and Curator, Rancho Santa Ana Botanic Garden, Claremont, 1961-62.
Assistant, then Associate Professor, Stanford University, Stanford, 1962-71.
Senior Research Fellow, New Zealand Department of Scientific and Industrial Research, 1969-70.
John Simon Guggenheim Memorial Fellow, 1969-70.

U.S. National Academy of Sciences (1977); Council, 1983-86.
Governing Board, National Research Council, 1983-86.
Fellow, American Academy of Arts and Sciences (1977).
Foreign Member, Royal Danish Academy of Sciences and Letters (1980).
Foreign Member, Royal Swedish Academy of Sciences (1982).
Honorary Member, Royal Society of New Zealand (1984-).
Fellow, Linnean Society of London (1981-84); Foreign Member (1984-).
Fellow, California Academy of Sciences (1964).
Fellow, American Association for the Advancement of Science (1980).

Honorary Degrees: D.Sc., St. Louis University, 1982; D.Sc., Knox College, 1983; D.Sc., Southern Illinois University at Edwardsville, 1983.

Honors: A. P. DeCandolle Prize, Geneva (1970); Distinguished Service Award, Japan America Society of Southern California (1977); Award of Merit, Botanical Society of America (1977); Achievement Medal, Garden Club of America (1978); Willdenow Medal, Berlin Botanical Garden (1979); Honorary Curator of Phanerogams, Museo Nacional de Costa Rica (1980-); Socio Honorario, Sociedad Argentina de Botánica (1981-); Distinguished Service Award, American Institute of Biological Sciences (1981); Vice-President, XIII International Botanical Congress, Sydney (1981); Rudi Lemberg Travelling Fellowship, Australian Academy of Science (1981); Joseph Priestly Medal, Dickinson College (1982); International Environmental Leadership Medal, United Nations Environmental Programme (1982); Gold Seal Medal, National Council of State Garden Clubs (1982).

Officer of the following societies: Vice-President, California Botanical Society (1968-69); President, American Society of Plant Taxonomists (1972); President, Botanical Society of America (1975); President, Society for the Study of Evolution (1978); President, Association of Systematics Collections (1980-82); Treasurer (1981-84) and Vice-President for Development (1984-85), and President (1985-86), Organization for Tropical Studies; President, American Society of Naturalists (1983); President, American Institute of Biological Sciences (1983-84).

Editorial: Editor-in-Chief, Brittonia (1963-66); Flora Neotropica (1965-84); Editorial Board, Memoirs of The New York Botanical Garden (1966-84); North American Flora, The New York Botanical Garden (1966-84); American Naturalist (1967-70); Annual Review of Ecology and Systematics (1971-75); Evolution (1963-65, 1976-79); Flora of Ecuador, Stockholm (1974-); Evolutionary Theory (1975-); Adansonia, Paris (1976-); Journal of Biogeography (1978-); Science (1979-82); Proceedings of U.S. National Academy of Sciences (1980-); Advisory Board, Applied Botany Abstracts, Lucknow (1981-); Advisory Board, Tropical Plant Science Research (1982-); Science Year Editorial Advisory Board, World Book Inc. (1982-86); Bothalia (1985-).

Selected past committees: U.S. Committee for I.U.B.S. (1973-76, secretary, 1975-76, delegate to General Assembly, 1973); National Science Foundation Systematic Biology Panel (1973-76); Arnold Arboretum Visiting Committee (1974-81, Chairman, 1976-81); Board of Overseers, Morris Arboretum, and Associate Trustee, University of Pennsylvania (1977-81); Chairman, Committee on Research Priorities in Tropical Biology, U.S. National Research Council (1977-79); Chairman, Committee on Scientific Exchange with the People's Republic of China, Botanical Society of America (1978-84); Assembly of Life Sciences, National Research Council (1979-81); Committee on Membership, American Academy of Arts and Sciences (1980-82); Committee on Selected Research Problems in the Humid Tropics, National Research Council (1980-82); Executive Committee, American Association of Museums (1980-1983); Commission on International Relations, National Research Council (1981-82); Commission on Museums for a New Century (1981-84); Chairman, Committee to Visit the Department of Organismic and Evolutionary Biology, Harvard University (1982-84, and Member 1984-); NASA Life Sciences Task Group (1984-).

Selected current committees: Commissioner of Tower Grove Park, St. Louis (1971-); Scientific Advisory Board, Pacific Tropical Botanical Garden (1975-) Council, OPTIMA (Organization for the Phyto-Taxonomic Investigation of the Mediterranean Area) (1975-89); Council, International Association of Botanical Gardens (1976-); National Museum Services Board (1977-1987, Chairman, 1984-); International Committee for ICSEB-III (1981-85); Board Member, Association for Tropical Biology (1981-); Council, International Association for Plant Taxonomy (1981-); Science and Engineering Panel of the Committee on Scholarly Communication with the People's Republic of China (1981-); Committee on Research and Exploration, National Geographic Society (1982-); International Scientific Advisory Committee of Wau Ecology Institute, Papua New Guinea (1982-); Board of Directors, World Wildlife Fund-U.S. (1983-); Advisory Board, Miller Institute for Basic Research in Science, University of California, Berkeley (1983-86); Chairman, NSF Advisory Committee for Biological, Behavioral, and Social Sciences (1984-); National Academy of Science Committee on Human Rights (1984-87); Chairman, IUCN/WWF Plants Advisory Group (1984-); Center for Ecology and Development, Gholvad, India (1984-); Chairman, NRC Advisory Committee on Biological Diversity (1985-86); NRC Advisory Committee on ICSU (1985-88); Federal Council on the Arts and Humanities (1985-); National Steering Committee for ACA National Issues in the Arts Conference (1984-85).

Member of the following additional societies: Phi Beta Kappa, Sigma Xi, Missouri Academy of Sciences, Society of Systematic Zoology, Geological Society of America, Botanical Society of the British Isles, Société de Biogéographie, Sociedad Botánica de México (life), Association of Science Museum Directors, Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale, Association of Pacific Systematists.

Miscellaneous: Program Director, (1966-71) and Chairman of the Council (1976-79), Flora North America.

Books:

Native Shrubs of Southern California. University of California Press, Berkeley and Los Angeles. 132 pp. 1966.

Papers on Evolution. Little, Brown & Co., Boston. xii + 564 pp. (with P. R. Ehrlich and R. W. Holm). 1969.

Biology of Plants. Worth Publishers, Inc. (with H. Curtis). xi + 706 pp. 1970. Second Ed., 1976 (with R. Evert & H. Curtis). Third Ed., 1981.

Principles of Tzeltal Plant Classification. An Introduction to the Botanical Ethnography of a Mayan-Speaking People of Highland Chiapas. Academic Press, New York and London. xxii + 660 pp. (with B. Berlin and D. E. Breedlove). 1974.

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Advances in Legume Systematics. Royal Botanic Gardens, Kew. 1-1049. (2 vols.) R. M. Polhill and P. H. Raven (eds.). 1981.

Biogeography of the Tropical Pacific. Proceedings of a Symposium. Assoc. Syst. Collections and the Bernice P. Bishop Mus. as Bishop Mus. Special Publ. No. 72. 221 pp. Radovsky, F. J., P. H. Raven, and S. H. Sohmer (eds.). 1984.

Selected papers (from more than 300 titles, 1950-present):

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A comparative study of mitosis in the Onagraceae. Amer. J. Bot. 49: 1003-1026 (with M. Kurabayashi and H. Lewis). 1962.

Amphitropical relationships in the floras of North and South America. Quart. Rev. Biol. 38: 151-177. 1963.

Butterflies and plants: a study in coevolution. Evolution 18: 586-603 (with P. R. Ehrlich). 1965.

Differentiation of populations. Science 165: 1228-1232 (with P. R. Ehrlich). 1969.

A revision of the genus Camissonia (Onagraceae). Contrib. U.S. Natl. Herb. 37: 161-396. 1969.

Natural regulation of plant species diversity. Evol. Biol. 4: 127-162 (with M. P. Johnson). 1970.

A multiple origin for plastids and mitochondria. Science 169: 641-646. 1970.

The origins of taxonomy. Science 174: 1210-1213 (with B. Berlin and D. E. Breedlowe). 1971.

Plate tectonics and Australasian paleobiogeography. Science 176: 1379-1386 (with D. I. Axelrod). 1972.

Energetics and pollination ecology. Science 176: 597-602 (with B. Heinrich). 1972.

Evolution of subalpine and alpine plant groups in New Zealand. New Zealand J. Bot. 11: 177-200. 1973.

General principles of classification and nomenclature in folk biology. Amer. Anthrop. 75: 214-242 (with B. Berlin and D. E. Breedlove). 1973.

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