# Computing Community Consortium
# Response to December 5, 2019 Reverse Site Visit Panel Report
# January 28, 2020

**Introduction:**
The Computing Community Consortium wishes to thank NSF and the members of the Review Panel for their time and effort in preparing for and thoroughly reviewing all aspects of the CCC. The formal review meeting provided many opportunities for good discussions and healthy suggestions with a wonderful team of researchers that have already resulted in great reflection. The report provided a good summary of the formal review, and we were pleased with the positive feedback and recommendations provided.

Below, we will respond *in italics* to each section of the orginal report in plain text, establishing our plans for implementing the suggestions.

## I. Executive Summary

This report documents the findings and recommendations of a Reverse Site Visit held for the Computing Community Consortium (CCC) at the National Science Foundation on Dec 5, 2019. The review panel had previously read the 2017 CCC proposal, the annual report, the recommendations of the previous reverse site visit, and associated materials. At the Reverse Site Visit, the CCC leadership presented its progress including addressing topics that the panel requested. Further they answered questions in a detailed Q&A session.

The panel was impressed by the CCC's presentation of the progress over the past 2 years. It has been a time of significant activity and success. In particular, the "20 Year Community Roadmap for Artificial Intelligence Research in the US" was an unexpected activity that the CCC engaged in a 13-month intense sprint to bring to fruition. This effort was one of the CCC's biggest commitments in time and effort, and also correspondingly has had great visibility and likely will have significant impact. The committee applauds the effort the CCC put into this, and regards it as a success. The activity had buy-in from key stakeholders in the AI community and funding agencies, and follow up with funding agencies and beyond is a model of the kind of impact the panel feels the CCC is uniquely positioned to catalyze.

Beyond the AI Road map, the panel commends the CCC on making significant progress on multiple fronts and adding value to the community:

- Increasing engagement of early career faculty through participation in their workshops and white paper reports,
- Broadening engagement in the Council and among workshop participants. The gender balanced CCC Council membership and the balanced profile of attendees (gender, geography) in workshops are commendable,
- Reaching out to the American Association for the Advancement of Science for greater engagement which we strongly encourage to continue,
- The report on Industry-Academia relations which was timely, and

- Creating "Gems" as indicators of impact that can make the case for the CCC's value going forward.

  We thank the CCC Chair, Vice Chair, and staff for their excellent work, leadership, and service to the community, and we are confident the incoming Chair will be able to take CCC's impact to the next level.

We agree with the articulated desired outcomes of the CCC: increasing federal agency awareness, engaging the computing-research community, creating high-impact tangible resources, growing awareness of CCC, and growing leadership and community capacity.

*We thank the panel for their thorough analysis, gracious compliments, and thoughtful recommendations for further improvement. As is typical in intellectual work, we will treasure the compliments, but move immediately to considering the recommendations in detail and formulating plans to address them.*

Our recommendations going forward are outlined below. The detailed recommendations are given in subsequent sections.

1. **Strategic planning of portfolio.** The CCC has had successes, and now is in a position to define a more strategic approach to create successful impact. They should develop an intentional strategic plan about how to balance activities in size and scope ranging from big activities (like the AI roadmap) to visioning workshops, to white papers. The RSV Panel recommends that the CCC attempt to engage in a large-scale activity approximately once every two or three years.

   *The CCC acknowledges that in the past we have been more tactical, sometimes appearing to be less strategic. At some level, this is necessary to be responsive to the environment we operate in (changing priorities of the administration, new areas of computing that the community needs help developing, etc.) where we must retain the nimbleness to recognize and capitalize on opportunities, as we did for the AI Roadmap.*

   *Nevertheless, we do realize the importance of strategically planning our portfolio as best as possible. We plan to do that going forward by developing guidelines for evaluation of potential activities, as well as follow-through after those activities. To begin the process of strategic planning, we will hold a retreat in May 2020 with the leadership team. This retreat will be explained further below. CRA is currently undergoing a broad strategic planning effort. While we do not anticipate major changes to CCC as a result of that effort, we clearly must remain cognizant of strategic planning in our parent organization. The CCC will use the results of the CRA process as input as we think through regular strategic planning processes to be institutionalized over the coming years. Among other things, the CCC will use its retreat as an opportunity to reflectively look at successes and failures from the past and determine what criteria we should use to evaluate importance and impact of activities, then use those guidelines to help us strategically make decisions about activities. We will then evaluate and refine this methodology on an annual basis.*

*We will also think more strategically about the activities of our task forces, ensureing appropriate coverage and balance as best as possible.*

2. **Coverage of CS.** Some areas of computer science seem to have been missing from visioning workshops and the CCC council. This is natural due to the limited slots. Nevertheless, the CCC should make a conscious effort to rotate areas of coverage to address gaps over time.

   *This is good advice. The CCC does always strive to maximize coverage as best as possible, but is creating a new mechanism (e.g., spreadsheet) to track areas covered over time to ensure that we are doing the best we can. However, while area coverage is a valuable input that deserves more exposure, CCC plans to continue to do workshops in areas and across multiple areas where catalyzing activity is most likely to have impact on the computing community and the country.*

3. **Follow-through on activities.** Each activity the CCC engages in should include a clear plan for follow-through activities to have an impact (e.g., lining up agency stakeholders ahead of time with the intent of disseminating workshop outcomes to them, having attendees/workshop chairs run town halls in conferences, etc.). Always committing to that kind of follow through is critical.

   *We agree that this is critically important and something we haven't always succeeded at. We are working on ways to facilitate better follow through, from staff, Council members, and participants in CCC activities—in part, by making such follow-through a more explicit component of workshop planning and execution. At the leadership retreat, we will brainstorm ways to better operationalize this follow through while respecting the uniqueness of different topics / activities and the time of our volunteer organizers and participants.*

4. **Communication.** The CCC should learn from best practices of similar institutions for how to maximize impact; clearly specify post-workshop expectations for workshop chairs and participants; and follow our suggestions on communication below.

   *Communication is something that the CCC is constantly working to do better. We have looked at similar institutions in the past and found that there are few we can learn from in this space. Nevertheless, we continue to value specific advice on opportunities that we may have missed or underestimated, and we will reach out to the CSTB, per the panel's recommendations, as well as other organizations (e.g., Dagstuhl). We will further expand upon our plans with respect to Communication going forward in section V below.*

5. **Outcomes.** CCC must find ways to assess its success in achieving the desired outcomes, be intentional in aiming to achieve them, and develop written best practices. Indicators of impact should be developed and maintained for **all** activities (workshops, workshop reports, white papers, etc.). A retrospective analysis might be valuable to develop future strategies.

*The CCC has always struggled to determine metrics by which to evaluate our activities, as what we do is unique and impact often manifests only after long periods of time. However, we realize the value of being able to determine if what we are doing is successful in achieving our desired outcomes. The idea of a retrospective analysis to inform future strategy development is a fabulous suggestion. To this end, we are already planning to do to two things: survey former Council members about the most impactful activities from their time on the Council, and what made those activities impactful; and survey former workshop organizers about the impacts of their activities (both short and long-term). We now have enough of a history, both in terms of time and numbers of activities, that we feel we could learn a lot from such surveys, to help guide potential for impact going forward. We will continue to track our recently initiated GEMS, and perhaps look for a way to quantify at least some of them as well.*

## II. CCC Goals, Strategies and Priorities

The high-level goals and strategies of the CCC have remained largely unchanged since its inception, with a focus on *catalyzing research in the computing community*, primarily through the articulation of research agendas in white papers and at workshops with associated reports. In addition to articulating new research agendas, the CCC has also developed reports on the computing research community itself, such as its report on the evolving academia/industry relations in computing research. In the last several years, the CCC has begun expanding its capacity through the creation of task forces and working groups in selected areas of interest, to amplify the efforts of its Council members in those areas.

Numerous audiences have appetites for the CCC's outputs, including: computing researchers; government agencies that fund computer-science research, the computing industry, and the general public. Producing outputs that impact *all* of these communities is a challenging task, and so it is natural that CCC prioritizes some audiences over others in attempting to maximize its impact. When asked about this prioritization, the CCC leadership indicated that researchers and government agencies who fund them are the audiences of primary interest, which seemed entirely appropriate to the RSV Panel.

The CCC leadership reported on their initial efforts to engage members of the computing industry in CCC activities, specifically on the CCC Council and in CCC workshops. The leadership expressed concerns about the possibility of industrial engagement influencing the workshop outcomes to benefit the relevant companies.

A major activity for CCC this past year was the authoring of a roadmap for artificial intelligence research. To the CCC's credit, it managed to pull this off in just one year. The RSV Panel felt that this effort was a model for CCC to try to replicate in the future (albeit not necessarily on such an aggressive timeline!). In particular, this activity is referenced in the recent call-for-proposals for NSF AI Research Institutes, which promise to be major drivers for AI research in the US for the foreseeable future.

A significant discussion concerned how workshop topics are identified and developed to advance CCC goals. While some topics are clearly timely and strategic, there was some concern about

uneven coverage. For example, some topics seem to have in-depth coverage through a series of workshops, while other prominent topics such as computer vision are not covered.

CCC leadership has identified the process of topic selection as falling into three bins: "top down", "sideways" and "bottom-up". The AI Roadmap is an example of the top-down approach. The Wide-Data Analytics topic was developed through the sideways approach via interactions spanning the Systems and Architecture task forces, whereas the Thermodynamic Computing topic welled up from the community, and thus through the bottom-up process. Going forward, we see this reflection on the process of how topics are identified as a good starting point for further development, especially when combined with the key parameters that are predictors of success, such as timeliness, agency/sponsor interest, etc.

An element of the CCC's strategy to maximize its impact is a communications plan that has grown to include AAAS engagement (e.g., panels) and podcasts, alongside its traditional focus on workshops, reports, and white papers. As a stated goal of the communications plan is increasing engagement from and influence in the computing community broadly defined, the RSV Panel encourages the CCC leadership to explore new means to reach and involve subcommunities of computing researchers that have traditionally been underserved by the CCC, such as computational biology.

**Recommendations:**

1. The CCC leadership should deliberate as to the proper balance of visioning activities in terms of size and scope (i.e., ranging from very ambitious, such as the AI roadmap, to more specialized) and in terms of the "direction" from which these activities are derived (top-down, bottom-up, sideways). Part of this evaluation should include the cost vs. benefit of the series-of-3 workshops as a method for conducting more ambitious visioning activities (e.g., Assured Autonomy), coupled with significant follow-through for such a commitment. The RSV Panel understands that large-scale initiatives are often driven by external demand and so cannot always be planned, but the RSV Panel recommends that the CCC attempt to recruit such a large-scale activity approximately once every two or three years. The impacts of such efforts are compelling.

   *The CCC agrees that we need to assess the proper balance of activitiy type, and not just with respect to visioning activities. We want to plan accordingly, but we realize that we also need to be responsive to needs that may be unforeseen at planning time, so an effective balancing strategy will take some reflection. The leadership of CCC will be discussing this at our May 2020 retreat. As the panel recognized, the AI Roadmap was primarily Top Down; we had been tracking AI for a while through previous smaller activities, yet realized it was time for a MAJOR activity in the space through conversations with Agencies and the community. We feel that an activity of this magnitude and with the potential for such impact, is not the type of activity that can or should be recruited.*

2. Some areas of computer science seem to have been missing from visioning workshops, white papers, etc. This is natural, as a limited number of visioning workshops per year cannot cover all of computer science every year. The CCC should make a conscious effort (as they explained at the RSV Panel they actually do) to rotate areas of coverage through membership in the CCC Council so that over a multiyear period these gaps will be addressed.

*We see area coverage as a valuable input for selecting workshops. Nevertheless, as stated above, CCC plans to continue to do workshops in areas and across multiple areas where catalyzing activity is most likely to have impact on the computing research community and the country. This can result in non-uniform coverage of areas, but this imbalance should be explicitly chosen rather just implicitly occur.*

3. The CCC leadership should reinvigorate their efforts to engage the computing industry in their workshops and report production. The CCC team raised concerns about the perception of corporate influence on the report outcomes. The RSV panel understands that in certain cases (e.g., where it specifically presents perception problems due to the topic of the report), industry participation might not be solicited.

   *We will continue to work hard at ensuring industry participation in all activities insofar as possible, realizing that this is sometimes out of our control (viz., industry participants who are not allowed to participate and/or put their name on something). We feel the current environment creates a double-edged sword: on the one hand, industry representation may actually get a little easier in the near future, as we see the lines between academic and industry research becoming blurred as more people have joint appointments, but the same blurring of lines creates potential conflicts as researchers' interests may no longer be driven by free and open curiosity, but rather the bottom line to shareholders.*

## III. CCC Leadership and Management

The CCC's current leadership has been very strong, and the CCC has done a great job of seizing the opportunity of the AI Roadmap Project and navigating it to a very high-impact conclusion. The leadership-transition plan, whereby the Vice Chair serves for two years, then serves as Chair for two years, and then serves as Chair Emeritus for one year allows for ramp-up, fresh ideas, and continuity.

The CCC leadership believes that the CCC has the right organization, but needs some staffing enhancement at the junior level to free time for the senior staff. The Panel is sympathetic to this argument, but would like to see the CCC specify explicitly how the staff could not merely "do more workshops" but actively help the leadership, the Council, Task Forces and the like be more effective in achieving the Desired Outcomes spelled out in the CCC Strategic Plan. Developing such an explicit plan would help the CCC leadership assess whether their organization and staff is adequate for the task.

The CCC has a smooth working relationship with CRA. The CCC has a tight working relationship with the NSF management team under the Cooperative Agreement. The Panel recommends a mutual evaluation of the form of this relationship in order to enhance its effectiveness. For example, it may be useful to bring into regular conversations program officers or management from different CISE divisions.

**Recommendations:**

1. The CCC must formulate written guidelines regarding how the leadership, the Council, the Task Forces, and the staff could work together to be more effective in achieving the Desired Outcomes spelled out in the CCC Strategic Plan. Specifically, the desired outcomes are: increase federal agency awareness, engage the computing research community, create high-impact tangible resources, grow the awareness of the CCC, and grow leadership and community capacity. The CCC must find ways to assess its success in achieving these outcomes, be intentional in aiming to achieve them, and develop written best practices.

   *As explained above (Section I, 5), we feel that a first step in determining how we can guide impact toward the Desired Outcomes will be to look back at our most impactful activities in the past. We plan to do this in the coming months, and will then generate guidelines for future activities to work towards better overall impact.*

2. The CCC leadership and NSF should review together the form of their working relationship under the Cooperative Agreement.

   *The CCC agrees with this and has already spoken with CISE about the frequency of interactions. We fully agree with the panel's suggestion to bring people from different CISE divisions into the regular CCC conversations and hope we can work with CISE leadership to make this happen (realizing that we're at an interesting time due to the current changeover of staff at the leadership levels within CISE).*

## IV. CCC Activities and Budget

The CCC advances its core mission by organizing workshops and developing white-papers on key topics. Governance is provided by the Council and the key activities are developed with the guidance and engagement of "task forces," where each task force focuses on a specific thematic area; currently, there are 7 task forces covering topics such as AI, Cybercrime and cybersecurity, Health and computing, Industry relations, etc.

The CCC is to be commended for maturing their workshop strategy and putting in place best practices for seeking out topics and supporting the organizers to be effective by developing strong reports and leveraging those for advocacy. A key strength is the support provided to early career workshop organizers. Nevertheless, post-workshop activities need strengthening. These include the uptake of reports or report summaries and materials derived from the reports for research advocacy and community building. It is notable that several workshops have resulted in reports that have already demonstrated potential to influence future research directions and programs. These outcomes should be expanded through focused effort to develop a program of post-workshop advocacy activities. A major success is the recent development of a "20-Year Community Roadmap for Artificial Intelligence Research in the US" which is already being referenced in the newly announced AI Centers solicitation. Further, the report is comprehensive and thorough, mapping out in detail key thematic areas of importance within AI and recommending approaches to develop them. As these areas advance in the next two years, the CCC should seek to leverage opportunities for effective advocacy and stakeholder engagement.

The distribution of CCC activities, both programmatically and budgetarily are largely appropriate. Additionally, with over 12 years of successful development, there is an opportunity

to leverage lessons learned to inform the development of a portfolio of activities that can drive outcomes and guide efficient operations and effective staff development.

The RSV Panel observes that an important component is missing from the activity and the budget: organized promotion of report results, through engagement with appropriate agencies, communities, and press. These activities are not planned for and not budgeted for; see "Learn the best practices" (Section V, Recommendation 1) below for suggestions of activities.

In summary, the RSV Panel is pleased with recent successes and recommends that the CCC leadership undertake an assessment and portfolio planning process to guide the effective management of resources in support of overall CCC strategic priorities. Such a process can enable proper coverage of topical areas, amplify outcomes, and lay the foundation for future growth.

*The CCC appreciates the recognition of the maturing workshop strategy and agrees that best practices must be developed to support community workshop organizers in effectively developing and leveraging reports and other deliverables. Through the discussions with the reviewers and this report, we realize that we can and should do more to fully leverage these post-workshop activities. To do this, we feel that it is important to be introspective and look back at our history of activities to undertand which were more impactful and why, as well as which ones were important for the community. Then, once this is ascertained, we can better target our activities going forward: both in guidelines and suggestions to the organizers before a workshop begins and in focusing staff resources in supporting activities. To be introspective, we are planning to conduct two surveys in the near future: one of former Council members and one of former Workshop Organizers, as described above (Section I, 5 and Section IV, 1). We are also revamping our Communications Strategy, as described in Section V, to help with organized promotion of workshop activities. In addition, we will continue to work with CRA Government Affairs, when appropriate, to leverage post-workshop activities for the community.*

*We also want to share that while we agree that the AI Roadmap activity was by all accounts, a success, it was not an easy success, as extensive time and resources were utilized throughout the process to support such a broad and extensive community activity.*

## V. CCC Communication Strategy

Impact is achieved by doing outstanding work at an opportune time and by communicating the results of this work effectively to various stakeholders. Effective communication is thus central to impact.

The CCC has made significant progress in the past few years, increasing and structuring communication with the goals of increasing impact, broadening participation, and growing engagement.

The impact achieved by the "20-Year Community Roadmap for Artificial Intelligence Research in the US" is a sterling example. This very substantial project required intensive effort, but was accomplished in only 13 months from conception to delivery. The Association for the

Advancement of Artificial Intelligence (AAAI) was brought in as a partner - one of many examples of the CCC's outreach and inclusiveness. The project chairs and workshop participants included the leadership of the AI field as well as a broad cross-section of researchers from academia and industry. The report was widely briefed, including a town hall at AAAI meetings and briefings at OSTP, NSF, DARPA, NITRD AI-IWG, DIB, NSCAI, ITIF, Lincoln Lab, NSF Big Data Innovation Hubs, and Hill staff. CCC leadership and study leadership devoted extraordinary effort not only to the workshop and report, but also to the dissemination of the findings in ways that have strongly influenced research direction and investment.

The involvement of AAAI in the AI Roadmap is one example of the engagement of other organizations in CCC activities. Such engagement builds bridges, increases the visibility of the CCC, and increases impact. There are multiple forms of engagement that establish important communication channels and deliver short-term and long-term value:

- "Partner engagement" with other organizations in the computer science field, such as AAAI's engagement in the AI Roadmap project.
- "Horizontal engagement" that brings computer scientists together with leaders of other fields to illuminate new collaborative opportunities at the boundaries, such as the engagement of economists in the "Algorithmic and Economic Perspectives on Fairness" project.
- "Vertical engagement" that brings together researchers at various levels of the "stack" in situations where collaboration is essential; "Next Steps in Quantum Computing: Computer Science's Role" is an example where the "stack" from physics to architecture to software to algorithms.

The consistency and quality of workshop reports is another area of notable progress. Not every workshop report has the breadth and depth of the AI Roadmap report, of course, but it is clear that considerable effort has been devoted to ensuring that workshop chairs, workshop participants, and CCC staff produce high quality artifacts that document the results of each workshop.

Other improvements in communication in recent years include creating a visible and reliable presence on arXiv, reworking the CCC website, institution of the "Catalyzing Computing" podcast and its translation into podcast engagements with the American Association for the Advancement of Science and the Heidelberg Laureate Forum, an annual session at the AAAS Annual Meeting, and the "Blue Sky" conference tracks (this latter item going back a number of years).

All of this represents significant progress. There are, however, many opportunities for further improvement.

In general, we feel that there has been a great deal of progress in specifying the processes, procedures and expectations up to and including the production of the workshop report, but far less progress in specifying the processes, procedures and expectations for the strategic communication of results in order to maximize impact. CCC needs a communication, engagement and outreach plan that is strategic and executable within available resources.

Prioritization is necessary - prioritization of "targets" (at the RSV the CCC suggested the community, the federal government and federal funding agencies, and in some cases public media) and prioritization of mechanisms.

**Recommendations:**

1. Learn the best practices from neighboring agencies for how to maximize impact. Liz Bradley, as incoming CCC Chair, should consult with the Chair (Farnam Jahanian) and Senior Director (Jon Eisenberg) of the National Academies Computer Science & Telecommunication Board to explore how CSTB and similar NASEM Boards and Committees structure their communication activities. What are the vectors of communication? What is the role of staff? What is the role of study chairs, and of study committee members? We recognize that NASEM and CSTB are at different scales than the CCC and CRA, but they have been at this for a long time with considerable success, and there will be things to be learned.

   *The CCC agrees that studying the efforts of similar organizations would be useful in assessing current practices and identifying potential improvements. Current CCC Chair, Mark Hill, has done this informally in the past (visiting NSF, DARPA, OSTP, CSTB, NIST, NLM and other agencies in Fall of 2017 at the beginning of his tenure), but we recognize that a more thorough and explicit approach is necessary. Moreover, CCC has had considerable interaction and synergy with IEEE, especially with their "Rebooting Computing" initiative.*

   *Vice-Chair Liz Bradley has initiated contact with Jon Eisenberg of CSTB. The CCC will pursue communications again with NITRD and other similar organizations over the next year. The CCC will also consider bringing in a communications consultant to assist with a new communications plan for crafting (or re-blogging) articles for Medium.com.*

2. Whereas the 2018 communication plan is impractical to execute and poorly prioritized, and whereas in any future proposal there must be a better plan and evidence that the CCC can execute it, the RSV Panel recommends that CCC rewrite a prioritized strategic communication plan *now* and practice executing it.

   *The CCC plans to write a new communications and engagement plan, which will primarily be led by CCC Vice Chair, Liz Bradley, CCC Senior Program Associate for Engagement, Khari Douglas, and CCC Senior Program Associate for Communications, Helen Wright. The new communications and engagement plan will be one of the top priorities for the summer of 2020 and will go into specific details as to how CCC will prioritize communications and engagement going forward.*

3. The post-workshop expectations for workshop chairs and participants should be carefully documented and communicated, as should the contributions that chairs and participants can expect from CCC staff. Prospective participants in each workshop should commit to fulfilling these expectations at the time they agree to attend the workshop, and each

workshop should allocate an hour at the end for a focused discussion of followup activities.

*The CCC agrees that further documentation and communication of the expectations that we have for workshop chairs and participants could aid in the dissemination of post-workshop resources. The CCC also agrees that allocating time for a followup discussion at every workshop will prove beneficial, but an hour is perhaps too prescriptive and the exact timeline may depend on how discussions are going as well as logistical constraints.*

*Ideally, the CCC would like each workshop chair(s) to produce a post-workshop report and slide deck with follow-up trip(s) to DC to meet with relevant agencies/committees/programs. However, it is important to note that CCC workshop chairs and participants are volunteers and it is impossible for the CCC to force these colleagues to uphold all responsibilities suggested for a workshop. We understand that various circumstances get in the way, and will always work with workshop organizers and CCC members to enable as much as possible. Nevertheless, to enhance follow-through activities, we will establish expectations early and often, going forwards.*

**Tactical suggestions for communication with the research community:**

- Targeted: There should be explicit outreach to relevant ACM SIGs as part of the followup for each CCC activity. SIGBoard meetings provide a good forum for meeting many SIGs.

*We have made some efforts to execute this type of outreach—e.g., to the ACM when Elizabeth Mynatt was the CCC Chair and on the ACM Board. These have not been as successful as we would have liked and we plan to broaden those efforts in the coming year: e.g., by asking workshop organizers to work more directly with individual SIG leadership as related to specific CCC activities, and to make arrangements with the organizers of SIG conferences (and others) to disseminate the results of the workshops.*

- Targeted: There should be explicit outreach to all leaders of the relevant field(s) (for example, program committee members and authors at relevant conferences) as part of the followup for each CCC activity.

*The CCC is concerned that this recommendation could escalate to become unwieldy in scope. As an alternative, we propose to act on this recommendation to some targeted subset—e.g., those conferences that CCC council members attend or where we have Blue Sky tracks. This could also be part of the suggested follow-up for CCC workshop organizers e.g., reaching leaders in different fields via the relevant conferences.*

- Broad: Explore with CACM editorship possible arrangements under which technical/viewpoint material from CCC might appear regularly.

*The CCC strongly agrees with this recommendation and has begun drafting two articles—one on the Thermodynamic Computing workshop and one of the AI Roadmap—*

*for consideration in CACM. Moreover, we admit that previous recommendations encouraged us to do this. We had initial discussions with CACM leadership regarding this action item, but we followed through with one only one submission and it was not accepted. Going forward, CCC leadership will more deliberately push for quality submissions.*

● Broad: Designate a CCC liaison at each CRA member organization. Create a mailing list for these people. Send them a monthly or quarterly update with links to outputs and with a reminder to forward to faculty / research staff members. Alternatively, perhaps CRA has a mailing list that reaches all individuals at member organizations?

*The CCC agrees with this recommendation in theory, though it is difficult to see what alternatives exist from the current status quo. Department chairs should already take on this role to some degree. CCC has the blog (with RSS Feed) and participates in CRA's Computing Research News, so it is difficult to imagine how we could provide more value to department chairs or increase their bandwidth to read more updates. Our hope is that the build up of council alumni is creating a natural, invested version of this designated CCC liaison idea and we have discussed how to leverage this resource. For example, Council members are encouraged to mention the call for visioning proposals at a department meeting. Opportunities for greater networking with council alumni will be a topic of discussion during the drafting of the new communications and engagement plan.*

● Broad: Explore ways in which CRA can amplify CCC visibility (e.g., at the Snowbird Conference).

*The CCC has hosted an after-dinner talk at CRA's biennial Snowbird for the last 8 years and held a informal discussion session for Snowbird attendees and CCC Council Members during the 2018 Conference. CCC hopes to propose and lead future sessions at the Snowbird Conference, though this is not always feasible due to constraints with other sessions, as decided by the independent Snowbird Organizing Committee. The CRA as a whole is also developing a new strategic plan and some dicsussions have occurred amongst CRA staff about ways to increase the cross-promotion and organizational unity of CRA commitees. These discussions will hopefully lead to increased amplification of the CCC through CRA and vice versa.*

## VI. Plans for Moving Forward

The proposed plans (for activities in the remaining duration of the grant) appear reasonable. Because the AI Roadmap was a bulge in expenditures (fully justified by its successful outcome), within the current budget the number of visioning workshops will need to be curtailed. The CCC has demonstrated that it can adapt to shifting priorities (viz., AI Roadmap), but within the original remaining budget there is limited flexibility to adapt if another such opportunity arises. There is a current supplementary proposal that addresses these issues.

**Recommendations:**

1. The Annual Report and the RSV presentation itself list "Desired Outcomes" that are appropriate, but the PIs and staff should more systematically evaluate and document whether the activities (workshops, workshop reports, white papers, etc.) have achieved these outcomes. This evaluation need not take the form of quantitative "metrics": there can be other *indicators* of these outcomes. Indicators can include:

   ● Consideration of CCC reports in research-priority or funding decisions by Federal agencies (of course, the CCC is correctly modest in hesitating to claim credit for decisions that are "in the zeitgeist" anyway, but evidence that the reports *contributed* to wise Federal decision-making can be reported as an *indicator* of useful outcome).

   ● Publication of (an article about) a CCC report in a refereed venue such as CACM.

   ● Other useful kinds of indicators, which CCC has already documented in the form of "Gems."

   *The CCC has always struggled with how to document our "successes" while realizing that we are part of a larger ecosystem and that impact for visioning activities can evolve over the course of years or decades. To this end, we recently invented and initiated the GEMS mechanism that has been complimented above. We plan to continue and expand on the GEMS. Other new ideas include the survey (already mentioned) of past Council members and Workshop organizers, which will help us to better quantify impact over time. We will also restructure future annual reports to more closely align with our Desired Outcomes and describe how we are making progress towards those Outcomes.*

2. As part of the CCC's strategic planning (especially if there are more workshop proposals than can be funded), CCC management might consider a retrospective evaluation of the last few years' workshops: which ones were *more successful* (by any appropriate variety of criteria) and which were less successful; were there any characteristics of the workshops that (in hindsight) could have predicted success; and can these criteria be used for the (admittedly harder) task of predicting the future, in selecting which visioning workshops will have the most impact.

   *This is another reason for doing the surveys of past Council members and Workshop organizers described above. We hope to use that information to guide our decision making going forward.*

3. We recommend, for each workshop funded by the current grant (since 2017) the CCC list these indicators of success, and assess, "was this a less successful / more successful / home run" activity.

   *The CCC agrees with this recommendation in principle, but actually feels that looking at the activities funded by the current grant will not be effective, as the timeline is too short. AI is the only one that can outright declare major impact, but that is because we knew the environment was ready. Many of the other activities that we have embarked on since Spring of 2018, when spending on this award began, are too fresh (reports were just*

*finalized this past fall, and with the AI work, we've been unable to fully promote them). Further, visioning activities are supposed to be forward looking; a topic like thermodynamic computing may not see real impact for another 10 years. This is why we plan to survey past workshop organizers, but going back to much earlier activities that have had time to see impact.*

In summary, the RSV Panel values the incredible asset the CCC is to the computing community. We applaud the success of the past two years, and look forward to seeing the CCC build on this success going forward.

*We thank the RSV panel for their time and insight throughout this process. We look forward to discussing their suggestions at our leadership retreat in May 2020 and we anticipate that that planning process will allow us to be more strategic and effective in the future.*