

## Checking in with Ben Bederson

*By focusing on the user experience, the University of Maryland's Human-Computer Interaction Lab aims to improve lives through projects such as the International Children's Digital Library.*

Benjamin B. Bederson is an Associate Professor of Computer Science and director of the Human-Computer Interaction Lab at the Institute for Advanced Computer Studies at the University of Maryland, College Park. His work is on information visualization, interaction strategies, and digital libraries.

**UBIQUITY:** Why don't we start by talking a little about the Human-Computer Interaction Lab. Tell us something about its history.

**BEDERSON:** I believe we're the oldest center in the country focusing on research in Human Computer Interaction. We were started just over 21 years ago by Ben Shneiderman. He's still happily continuing to work here, but about four years ago, he asked me to take over as Director. We've chosen to remain a relatively small group, with a half-dozen faculty, about ten full-time researchers, and about thirty students, mostly working towards their PhDs. Our focus is thinking about the user experience: how can we improve people's lives using computers. I see our lab goals being to design, implement and evaluate novel interaction technologies that are universally usable, useful, efficient and appealing.

**UBIQUITY:** Who are some of the people involved in the lab?

**BEDERSON:** It was Ben Shneiderman for many years with Catherine Plaisant as a Senior Researcher. Kent Norman in psychology has been with the lab since Ben started it. Gary Marchionini was also a core member for many years. Then, seven years ago, Allison Druin and I joined followed by Doug Oard and François Guimbretière. And Jenny Preece will join us in January. So the Lab has been slowly growing, but none of us really has a strong personal goal of running a large center. It's a huge administrative job to make a large center, and we all love doing our research.

**UBIQUITY:** What is the mix of disciplines represented at the Lab?

**BEDERSON:** There are three: computer science, information studies and psychology.

**UBIQUITY:** How is it that you don't offer degrees?

**BEDERSON:** Our students receive degrees in one or another of the member departments. The majority of our students are in computer science and the next biggest chunk comes from information studies, and then a handful in psychology. There is enough flexibility in course requirements that students can take the courses they need from multiple departments. Our research is very interdisciplinary, so students' research fits right in.

**UBIQUITY:** What is your own background?

**BEDERSON:** Computer science -- I'm a techie. I have three degrees in computer science, which was probably the biggest strategic mistake in my life. I received my undergrad at Rensselaer Polytechnic Institute and my MS and PhD from New York University. At this point, though, I always suggest to students that they spend some part of their academic time studying in detail at least one other discipline to gain a broader perspective.

**UBIQUITY:** What, besides its relatively small size, distinguishes your Lab from other programs around the country?

**BEDERSON:** Partly, research focus. We have three areas of strength: one is information visualization, another is information retrieval, or digital libraries, and the third is a very strong focus on supporting children users. You can read more about how we carry out our information visualization work and how it evolved in "The Craft of Information Visualization" which I produced with Ben Shneiderman (Morgan Kaufmann, 2003).

We also have a strong emphasis on combining research with service. You can see this in lab projects such as the International Children's Digital Library, voting

usability studies, and our digital government efforts to make government statistics more broadly accessible.

**UBIQUITY:** What are some of the best visualization programs?

**BEDERSON:** There are several, including excellent groups at CMU, Georgia Tech, Minnesota, Stanford, Virginia Tech and Washington. We have some great colleagues and collaborators at those places, and I highly respect them. Our own special quality is that we are an unusually friendly and supportive environment. Ben Shneiderman often says that we should aim to only hire people that we would like to have lunch with.

**UBIQUITY:** That's practical.

**BEDERSON:** We've also worked hard to create a cooperative atmosphere, where students know about each other's work through brown bag lunches, reading each other's draft papers, and talk rehearsals in which we help each other improve our conference presentations. We even have an annual Symposium and Open House every June where we present our year's work to the public -- and we usually have about 300 people come. Some other places have a more competitive atmosphere. Essentially they suggest a feeling that if you're successful that makes me less successful. That's a cultural phenomenon, which I think is very unfortunate, and it doesn't exist here at all. People here feel very strongly that the more you're successful, the more I'm successful. If two people find themselves working on the same problem, they'll just figure out how to slightly shift what they're working on or work collaboratively. If one person gets a grant, it doesn't make the one that didn't get it feel mad. It just means that the institution is developing a stronger reputation and it will make us all better candidates next time around. So it's a very friendly and supportive place.

**UBIQUITY:** How does the Lab fit into the University of Maryland environment? How is it accepted?

**BEDERSON:** That's a good question for every HCI institution, because HCI is not a traditional core academic discipline. Many corporations reorganize themselves every

year to be more responsive to the needs of their clients. Academics on the other hand develop a department and then more or less keep it for decades. I think that's something that gives HCI challenges throughout universities. But the HCIL is special in that we have a really nice interdisciplinary home.

**UBIQUITY:** In what way?

**BEDERSON:** In that we're administered within a supportive interdisciplinary group called UMIACS, which is the University of Maryland Institute for Advanced Computer Studies. UMIACS is an institute with around forty faculty whose mission is to support interdisciplinary work between computing and other fields. It's an absolutely perfect home for HCIL, so most of the HCIL faculty have joint appointments between UMIACS and their home department. I, for example, have joint appointments with UMIACS and Computer Science. That gives us a lot of credibility, so even though my tenure case still went through Computer Science, UMIACS had some amount of influence over the decision. Since half of my efforts have been paid by UMIACS, half of what I do is supposed to be interdisciplinary.

**UBIQUITY:** Let's talk about your thoughts on "Flow," which you gave us in your recent paper for *Ubiquity*, "Interfaces for Staying in the Flow" [[http://www.acm.org/ubiquity/views/v5i27\\_bederson.html](http://www.acm.org/ubiquity/views/v5i27_bederson.html)]. What would you expect people to think about the paper? What would they object to?

**BEDERSON:** You have to start off with the hardest question first! It is easy to object to the fact that Flow is a fuzzy concept -- i.e., it's not a hard theory that can either directly propose new interfaces or evaluate them. At the same time, I still find the concept valuable as a way of helping me as a designer think about what makes the interface work. It might be helpful to understand how I came to think about Flow. It would have been nice if I thought of it as a conceptual theory first, and then started designing towards it -- but in actuality I did it backwards. I spent ten years developing interfaces that made sense to me intuitively. So you can think of my paper on Flow as a ten-year personal retrospective. As I was thinking back on what ties all of this work together, I happened to read this great book called "Flow" by Csikszentmihalyi and I realized that that was the language that captured the way I was thinking.

**UBIQUITY:** You joked that I started with a hard question, maybe the hardest. Is doing that something that hurt our Flow, the Flow of our conversation. Was it a good thing to do or not a good thing? From a Flow point of view.

**BEDERSON:** I would say it was actually a good thing -- but it could have been a bad thing. If I didn't have an answer it might have really sent me for a loop. Instead, I did have an answer. I had to think about it, it wasn't an easy answer, but it helped bring me to thinking about Flow very strongly and clearly at the beginning. And I think that is a good example of some of the basic characteristics of Flow that Csikszentmihalyi identified and that I tried to relate to interfaces -- which is that Flow is not about ease. I think Alan Kay would call it "hard fun." Flow is about challenging yourself so that you can do the very best job possible and do it in a way that requires complete and total concentration on the thing that you're thinking about. If, on the other hand, you wanted to print a document and couldn't figure out how to work the interface to print it, that would break the flow. You should just think "print" and then ideally your body should somehow, without any conscious thought, manipulate the interface so that printing occurs. That's the ideal tool, whether it's a pen and you think writing a letter and the letter comes out -- or it's a hammer and you think hammering a nail and the nail gets hammered -- or it's an interface and you think of doing something and your body knows how to execute it and it can get executed in an automatic way without having to go visually search the interface.

**UBIQUITY:** Are there important conceptual differences between the individual-user problem and the multiple-user problem? And let's include the adversarial user problem, like a tennis game, or any kind of game. A pitcher's Flow in baseball is not necessarily the same as the team's Flow, is it?

**BEDERSON:** Actually, Csikszentmihalyi did use tennis for a motivating example of Flow. What he said was that two novice players can experience Flow playing tennis just as well as two expert players. What's important is that there is a proper balance between anxiety and boredom. So if you have mismatched players -- and one is really anxious because he's afraid that he's going to be blown away and not going to get a single point and end up really looking bad, and the other is bored because all he has to do is just breathe and he wins, then neither of them are in Flow. But if

they're both concentrating and they're both trying hard and they're both at peak anxiety level, then that's when it works well. So in sports there's actually a nice model for Flow.

**UBIQUITY:** And beyond sports?

**BEDERSON:** Right; for example, what about cooperative document editing? That's a little bit harder because it's a different kind of timeline, especially if it's in a situation in which I work on a document for a couple hours and then you work on it for a couple hours and send it back to me. That scenario's obviously collaborative work but not in quite the same way as tennis -- where it's a dynamic, real-time attraction. So if we're shooting the document back and forth every few hours, I would argue that Flow comes back to more of an issue of individually interacting with the computer interface. Even though you're interacting with the other person, your primary immediate interaction is with the computer interface. On the other hand, if two people are working in front of a computer together, then Flow is an issue. In fact, one thing I didn't discuss in my paper about Flow is that I had done some earlier work on what I called "single display groupware." If you have multiple children sitting around a computer, like you often do in a classroom, how can you best support them? And when you only have one mouse and one keyboard and the entire interface is oriented towards supporting one user, then you have massive Flow problems because there typically is a more-dominant child who takes control of the mouse and keyboard and the other person becomes an advisor at best and often becomes disaffected and bored. So you have this improper balance between anxiety and boredom.

**UBIQUITY:** How did you deal with that?

**BEDERSON:** What we did is add a second mouse and make special software to support that second mouse. I developed with my team a storytelling program for children called KidPad -- which you can download at [www.kidpad.org](http://www.kidpad.org). Each kid can draw at the same time. You can ignore each other, but if you choose to work together then you can do special things that you couldn't do otherwise. It was a really fun approach, I think, to supporting children working together in this way. At

the time I didn't have the Flow language, so we weren't able to describe it that way. But now I think it perfectly describes our motivation there.

**UBIQUITY:** Do you ever analyze faculty meetings in terms of how much Flow they exhibit?

**BEDERSON:** Well, big meetings I think are rarely Flowful, except perhaps for the leader. On the other hand, sometimes there can be a pretty vibrant discussion going on, with people really engaged and making comments and responding to each other. And that can be more Flowful.

**UBIQUITY:** I guess what I'm wondering about is whether Flow always captures what's important. In a discussion you might actually want conflict as much as you do Flow -- is that right or not?

**BEDERSON:** Flow is only one of the positive characteristics of an interaction; there are lots of other metrics for ways that interactions with other people or devices are good or bad. If one person is giving a lecture for an hour, it's very hard for the rest of the audience to really be deeply engaged. It might occasionally happen but it's not that common. It's very hard to be deeply engaged if you're not participating in some way. At least to me personally, the most exciting kinds of meetings are when there's some real interaction.

**UBIQUITY:** Right.

**BEDERSON:** If there are a few people that are silent on the sidelines, well it's like they're not really part of the meeting. So I'm not sure that what you said is two separate things. But of course this is the place where the advantage of Flow being a fuzzy concept is to my advantage.

**UBIQUITY:** What other major themes are there now in your HCIL besides Flow?

**BEDERSON:** I'm not quite sure I would describe Flow as a major theme. I think the earlier way I described it would be the way I would describe our themes, and that Flow is a concept I would use to describe a way of thinking about what we do to help

make sense of it. Or maybe I could say the exact opposite, which is that even though not everyone uses the language of Flow everyday in our Lab, I think that it does capture an essential philosophy of our Lab, which is that if you really want to support the user to do their tasks, then you have to ask what makes the user's best experience. The answer to that is found by focusing on the task and being productive at the task. I think Flow is just another way of saying the same thing. So I think that is a fundamental base motivation for what almost everyone here does.

**UBIQUITY:** Do you think Flow has a different nature when it's part of a research project than when it is part of an educational process?

**BEDERSON:** What's new about Flow is it's a language, a way to think about communication, that I think makes sense to people. And I think that's very valuable. It's the same thing for educational theories: there's constructionist theory that's decades old but if you go up to average students and talk about constructionist theory they'll give you blank stares. But if you ask them, were you feeling engaged, were you feeling the Flow when you were in class last hour? -- they'll know exactly what you're talking about. So that's why when I started thinking about it, it really hit home for me because it is a language to help me express what I'd been thinking about for a decade. And I think language is very important. If you don't use clear ways of communicating what you're thinking, then your thinking is not going to be as clear.

**UBIQUITY:** Is there a big literature on Flow in general human interaction?

**BEDERSON:** Yes. The whole concept came from the academic psychologists, starting with Csikszentmihalyi, but there is a large literature that follows this and in past years has been in fact trying to apply it to other domains.

**UBIQUITY:** Do you feel that you've still got a lot of work to do in this, or that the accomplishment is to have the essential insight and then it's basically done?

**BEDERSON:** That's a good question. It could go either way. If I never did another explicit bit of work on Flow I think it would be already valuable, as it gives some language and some way of motivating designers. That was the easy part. The hard

part is to fill in the blanks and be more prescriptive and say here's an interface, I want to make it more Flowful -- what do I need? I don't have a direct answer for that now. So the remaining work is to take this theory and turn it into prescription, into guidelines.

**UBIQUITY:** Would I be wrong in suspecting that you could walk up to a student in a project the way an art instructor could walk up to student in a painting class and say things like, "You're giving it too much emphasis here, why don't you try doing such-and-such?"

**BEDERSON:** Yes, absolutely. But if you're not experienced I think that's probably hard to interpret.

**UBIQUITY:** Do you feel that there are many people such as yourself, who are pretty confident in understanding these things?

**BEDERSON:** Sure. There're billions of people out there -- and many of them are designing Websites! I think one of the big challenges of HCI is to teach design skills to everybody. Not that everyone has to design a Web page or be a visual designer, but there are a surprisingly large number of places where people author interactive electronic environments. It started off with developers of applications that work with graphical user interfaces but it expanded to include everybody building an interactive Flash or JavaScript thing -- and now every single Webpage, plus every single word document, is kind of a multimedia document with interactivity. So I think that there is a need for the general public to have some understanding of visual, interactive communications. I think it's a challenge, and I think it's going to take decades for society to develop the right balance between those kinds of authoring skills. Everyone has assumed that they have to have some level of literacy for text, but what should it be for interactivity? It's hard to imagine a kid growing up today without having some kind of personal need for some fairly significant level of interactive visual design. And if they don't, I think they'll feel like they're missing something.

**UBIQUITY:** Mentioning kids again reminds me of the International Children's Digital Library. Tell us what that's all about.

**BEDERSON:** Well it's definitely my most exciting current project. It is a Website – [www.icdlbooks.org](http://www.icdlbooks.org) -- whose goal is to make the best children's literature from around the world available to everyone for free.

**UBIQUITY:** In different languages?

**BEDERSON:** In different languages. The Website is up now with 531 books in 28 languages. We have a stated goal of within five years having 10,000 books from 100 languages, and we are just finishing our second year. We have five years of funding from NSF and IMLS (the Institute of Museum and Library Services). So we've got a long way to go but it's very exciting for lots and lots of reasons. First of all I can't talk about the project without mentioning my partners, Professors Allison Druin and Anne Weeks, both in the College of Information Studies at UMD. And the Internet Archive, which is a group run by Brewster Kahle in California. The ICDL is exciting for lots of reasons. Probably the first is that it's a library for children. Also, the whole interface from the bottom up has been designed through a close partnership with children. If you look, there are lots and lots of digital libraries and materials for children and a lot of it isn't child-friendly at all. But if you spend some time with the ICDL, hopefully you'll agree with us that it is broadly accessible, both from a direct visual design standpoint and from a conceptual standpoint. The other main thing is that we have actual books. There are lots of "digital libraries" that are actually only catalogues, and have no actual books.

**UBIQUITY:** Where do your books come from?

**BEDERSON:** Good question. That's been the role of Internet Archive in this project, to help us develop a collection. Currently we have about 40 percent public domain and 60 percent within copyright books. The public domain books were largely scanned and given to us by the Library of Congress and other national libraries around the world. But the current books are the real challenge. We've been meeting with publishers from around the world to help them understand that this is an opportunity to increase people's awareness of their books. Some of our users will read the books online and not give the publishers any money, but some of them will decide that this is a good book to buy and read, or buy and give to somebody else.

Or they may just recommend the book to someone else that goes and buys the book. The good news is that we have had major publishers that are intrigued by the idea and willing as an experiment to give us five or ten books and see how it affects their sales.

**UBIQUITY:** How far along are you in that relationship?

**BEDERSON:** It's still an ongoing experiment. It's clear that it is not killing their sales -- no one has all of a sudden reported they're not selling these books anymore. I think it's very likely the opposite but at the same time, it's a real challenge because even though it's an exciting Website and there are a lot of users -- we have about 30,000 unique visitors a month -- in terms of real population and the number of books that are sold, that's still small. So I think the bottom line is that we still have a long way to go.

**UBIQUITY:** One question: What levels of children are you talking about?

**BEDERSON:** Our target is ages 3-13. So there's a fairly wide range and books are catalogued partly based on what age range we think they're most appropriate for. But that also brings up some other interesting issues, which is how the books are catalogued. When I told you that we work with children, I want to tell you a little bit about how we work with children and what kind of impact that's had. Allison Druin (who, for full disclosure, I'm married to) focuses on working with children in a range of domains and she has what she calls "kidsteam," which includes six kids that are 7-11 years old. They come to the Lab two afternoons every week all during the school year, and then for two weeks to a full-time, sort of camp in the beginning of August. The role of these kids is to be partners in whatever children-related projects we're working on. So they're not testers -- the adults don't go design and build something and then have a kid evaluate it afterwards. The kids are involved from the very beginning in understanding conceptually what the project is about, how other children might think about it, and in the visual design and testing and then of course we also get outside testers as well. So these children helped us in the very beginning to think about how they wanted to use our books and they actually did real research; they went to libraries and observed other children in physical libraries looking at books, they interviewed other kids, they interviewed librarians. So in addition to

adults doing work, we also had children's helping us do real research in understanding this to get the children's perspective.

**UBIQUITY:** Sounds good.

**BEDERSON:** And there are a few very interesting outcomes of all that. One is that in addition to all of the regular ways to search for books, such as by author or by title or by subject, they felt strongly that it was also important to be able to search for books based on other kinds of characteristics, like the color of the cover. And so up front you can search for books by color and you can see that there's 34 books in the library that have an orange or an orangish color and 20 pink ones and 38 rainbow ones. And I can tell you that my daughter loves to read books that are pink.

**UBIQUITY:** What other characteristics can you search by?

**BEDERSON:** You can also search for how the book makes you feel, by the length of the book, and is the book true or make believe. There are all these other kinds of bits of metadata that are definitely not in regular libraries.

**UBIQUITY:** Well that's certainly novel.

**BEDERSON:** I think it's completely novel. And of course I should mention the version that's on the Web is already obsolete because we're in the late development stages of a completely new, even better, interface. One problem right now is that the broadly accessible version of the library doesn't support Boolean and there's one interface for everybody. So instead we're replacing it with two new interfaces, both of which support Boolean -- one that's oriented toward younger children and one that's oriented toward older children and adults. That will come out in the fall. I don't have an exact date yet, hopefully in October. But I wanted to point out that in addition to featuring an innovative search scheme, the other feature that's interesting is the reading interface. We have a traditional, low-tech interface which is actually not even completely traditional, because when you first click on a book cover on the overview screen, you get a screen with thumbnails of the first twelve pages and you can look through the book, twelve pages at a time, just looking at the thumbnails. And so that gives you a kind of a visual overview and then you can click

on any page and see a high-resolution jpeg of it and then go from one page to the next, just seeing one high-res page at a time. And for me it's great.

**UBIQUITY:** And for the children, presumably.

**BEDERSON:** Yes, absolutely. The children wanted something that was a little bit more fun and a little bit more playful and also something that helped them to better scan through the book -- the equivalent of flipping through all the pages of the book. And so to do that we developed two Java interfaces, which are problematic because they're Java and we've learned a lot about the difficulties of getting the general public to run software that requires plug-ins; it's a major challenge. And for many users, like those in libraries where they don't have control over their computers, it might be impossible.

**UBIQUITY:** Is this stuff that can be done on dialup lines?

**BEDERSON:** The Java, no, but the whole regular interface is pretty well designed for slow access. Anyway, the Java interfaces are very fun. There's one that's called "comic book interface" and it presents all of the pages at once, sort of a grid of thumbnails in what I call a zoomable user interface. It's something I've personally been working on for many years, and that is what motivated my Flow design. But the idea is you can click on the thumbnail and it will smoothly zoom in to a desktop thumbnail and you can click on it again and it'll smoothly zoom out to see the overview. And that animation, even though it only takes less than a second, really gives you a sense of Flow of being able to smoothly move to the book without having to spend too much time trying to remember where you were. That spatial layout and the temporal animation I think help to make it so you can more intuitively understand where you are in the book and how the pages relate to each other.

**UBIQUITY:** Where are you in the project? Are you going to be able to declare victory soon?

**BEDERSON:** I hope we can never declare victory, because I hope this project lasts forever. We have three more years of funding and one of our biggest goals aside from continuing to develop the interface and recruiting new book contributors, is

figuring out a financial model to make this project continue on. We receive incredibly good feedback from people all over the world -- librarians and parents and teachers and children -- that just love having an international library where you can go and compare, for example, Iraqi and American children's books next to each other. It's a kind of resource that doesn't exist otherwise. So there's really a huge interest in it. Unfortunately interest doesn't always correspond with money, so the challenge is to figure out how to make it last.

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