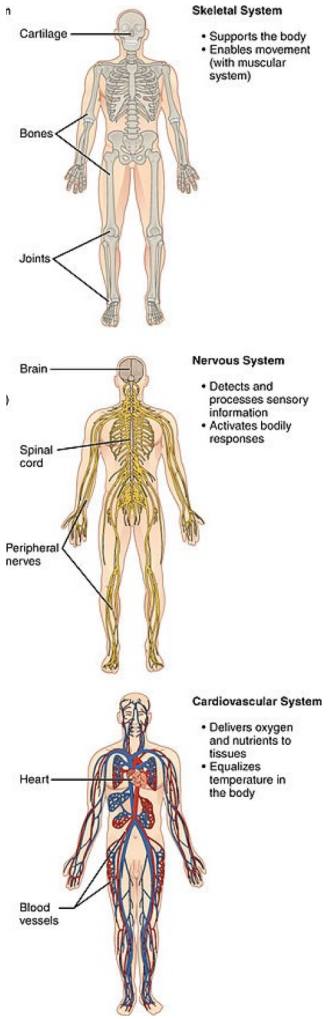

The 11 systems of the body:
skeletal, nervous, cardiovascular

Inbodied Interaction: 3 things you need to know about how your body works to lead HCI innovation

m.c. schraefel
University of Southampton
Southampton, UK
mc@nopain2.org

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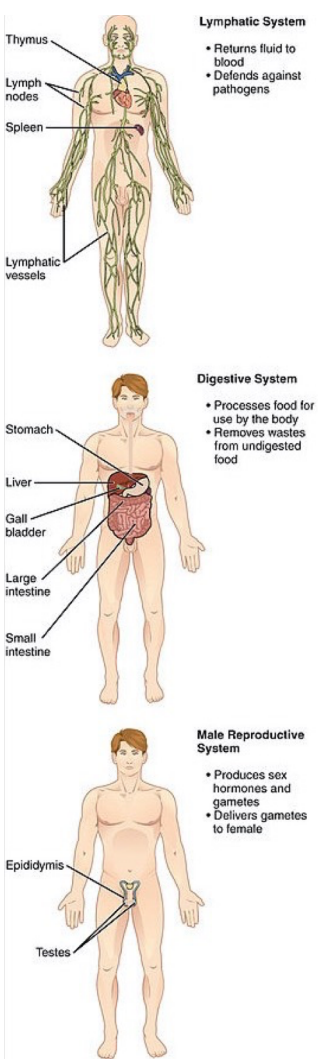
Abstract
From Ergonomics to Embodied interaction, the body is a fundamental locus of interaction in HCI research and design. In HCI the body and all its awesome complexity, however, is largely treated as a black box where we focus on designing around the constraints of its input and output. If we understand, for instance, how sleep affects ability to see errors, or how stress suppresses creativity or affects recall, or how social interaction with movement enhances insight, we can immediately begin to explore new kinds of design challenges to help us perform better from general to specific contexts: how would we design a tool that identifies sleep and stress patterns to prompt counter-intuitive but beneficial increase of social engagement prior to a critical deadline, for instance? In this course we explore how, by cracking the lid of the body black box via three accessible heuristics, we can address these new kinds of questions to enable us to innovate better designs for human performance and enhanced quality of life for all.

Author Keywords
Inbodied interaction, embodied, physiology, neurology, creativity, design, human performance, performance.



The 11 con't: Lymphatic, Digestive, Reproductive (male)

ACM Classification Keywords

H.5.m. Information interfaces and presentation

Course Rationale

The premise of this course is that by learning more about how our bodies work – or more particularly how the 11 complex systems (shown in sidebars) that make up our bodies from bones to hormones work - we will have the knowledge we need to take the leap forward necessary in the efficacy of our designs to make real and measurable differences in the world for human wellbeing and quality of life.

MOTIVATION: New Opportunities

The body has always been part of HCI from ergonomics to eye tracking to embodied interaction. That engagement has been predicated by the types of hardware and software limiting our interactions with computational systems: ergonomics is critical when we must align our bodies to an immobile system; as systems become more mobile/tactile, it makes sense to think of how our bodies mediate our interactions with devices as part of a larger ecosystem, but where the body is still largely a black box, of interest in terms of supporting its I/O.

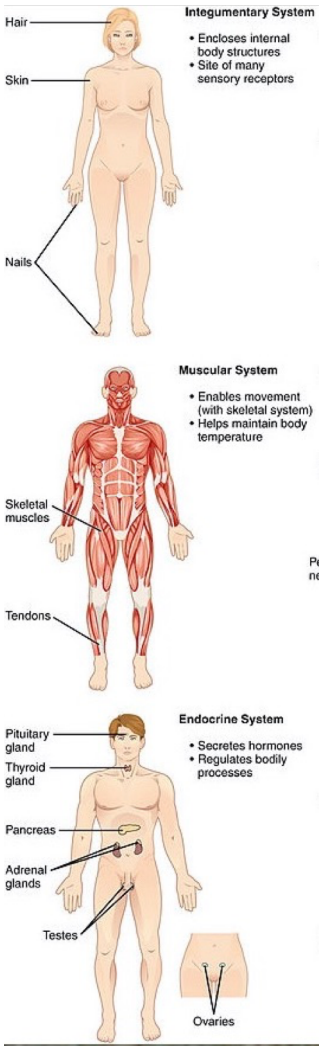
That interest is changing. As computational systems become smaller and more pervasive and autonomous, and increasingly data driven, and as opportunities to monitor every orifice increase, we can see HCI having more interest in what those systems tend to be used to monitor: us. Frequently this monitoring falls within what is framed as "health" but may also be work place efficiency or other measures of performance. With this focus only growing (considering how the numer of papers submitted to the Health track this year has nearly doubled) it seems an opportune time for us to chart a path to look inside the black box of the body. Our goal is to explore how understanding more about our inbodied complexity can help inform design of systems to support our embodied complexity.

This focus for HCI researchers to become more self-reliant about the body, to enable us to begin to look inside the body ourselves to see how that informs what we do in terms of designing for interactions with the body is a New Thing. Some people may say that we do not need to gain this expertise: we can continue to collaborate with doctors or physiologists or whomever who have this expertise. Yes we can of course, but HCI is an interdisciplinary field, where computer scientists learn about visual perception and cognition where psychologists learn to code and sociologists how to design. At the very least, with the approach this course offers, participants will be able to ask better questions and have more informed conversations with those domain experts.

Approach and Outcomes

To come to grips with all the awesome complexity from physiology to endocrinology with some microbiota in between takes years of study to gain expert knowledge. We have 160 mins.

The focus of this course is to give participants a sufficient introduction to the complexity of the body's interconnected systems that it is both accessible and of immediate and practical use. To this end, the course will present and practice a set of three concepts through which to start to develop better knowledge of the relationship of our inner processes on our outer practices.



The 11 con't: Integumentary, Muscular, Endocrine

These concepts are:

- Inbodied interaction
- The in5 map of inbodied interactions
- The binary body: the fundamental inbodied interaction

Model 1: Inbodied interaction will be framed in two related ways in the course: first as body-based process and second as an approach to interaction research and design. Thus process and practice.

In terms of *processes*, inbodied interaction considers

- How knowledge of various systemic interactions *inside* the body inform interactions *by* the body interacting as a whole in the world
- In other words, we will consider how *inbodied interactions* inform *embodied interactions*.

Inbodied interaction *as practice* like embodied interaction refers to a particular design focus. Understanding inbodied processes enables us to ask novel questions about designing technology to better support embodied interactions from social engagement online to navigating city spaces to learning a new language.

For example, we are all told to move more, and CHI has published a bevy of papers exploring mechanisms to motivate, track and nudge movement; success levels reported are not fantastic. From this course, participants may ask: is the lack of effect related to focusing on the site of pain as the source of pain – that is to get people to move more, we must focus on people's movement first.

Model 2: In5 (inbodied five) From this course we will use the in5 model that pulls together each of the 11 systems of the body within five fundamental processes between inbodied and embodied interactions, that fundamentally affect our wellbeing, ability to perform at any level cognitively or physically, and impact our quality of life. In brief these 5 processes are: eat, cogitate, engage, move, sleep. We will go into why these five relative to the more formal systems of the body in the course.

With this simple model, we gain two things:

BENEFIT1: first we can start with any one of the five to improve each of the other five simultaneously. We can find either the easiest path or the weakest link to achieve benefit.

BENEFIT 2: second, with this model, *we have a pathway into the more specific 11 systems of the body*. We will for example be able to explore the endocrine system connection with sleep and social engagement as effectors on movement, and from here how movement affects other systems not only cardio-vascular and musculo-skeletal but visceral and lymphatic as well.

In other words, by understanding how the in5 approach can be a framework to understand inbodied interaction, we build a secure and robust map to guide us into the richer complexity of the underlying physical systems.

BENEFIT 3: *broadening opportunities for HCI lead innovation*. In this example the inbodied approach to explore performance/wellbeing via the interplay of any of these 5 interactions – interactions we all already perform all the time anyway – opens up new

Prep for this Course

Preparation: No formal preparation is required, but easy reads include Raty's Spark, Le Doux's the Emotional Brain, Kahneman's Thinking Fast and Slow, Senek's Leaders Eat Last.

Materials: A mix of aretefacs, in-class demos and live participant tests will be used to convey the course concepts. We will also have group activities to explore how to apply these concepts in sample design scenarios

Practice in Class: Participants are encouraged to bring note books or whatever capture devices they like to use for drawing and taking notes.

opportunities for design. For instance, how might an intelligent application be able to leverage a focus on rather than a focus on movement to achieve more movement? Because of the interdisciplinarity of HCI, we have the skills within our community, from sensors to machine learning to ethnography, using this inbodied approach to innovate approaches to health practices. We also have the opportunity to understand WHY we might want to design something other than a step counter, too.

Model 3: Binary Body Fundamental to design in HCI research is the efficacy with which we can evaluate our designs. Part of the goal of inbodied interaction as a research and design practice is to support improving human performance. Human performance from an holistic, inbodied to embodied perspective refers to our capacity to engage with the world. If we are hungry not only is that a distraction, we are also nutrient deficient and this may affect our ability to carry out a particular task. If we are under slept, we may not make more errors than when we are well slept, but our ability to recognize them and correct them deteriorates exponentially.

BENEFIT 4: In the course we will learn how to leverage the very fast binary assessment used by the always on system of the body – the nervous system – to determine positive, negative or null effect of an intervention to affect human performance, immediately.

Course Organization

The approach of the course will be a mix of instruction and practicum across each of the two 80 minute sessions. *Session One* will cover InBodied Interaction and an introduction to the in5 model. *Session Two* Will go into more detail of in5 in terms of connecting these processes to internal systems. We will also cover the Binary Body evaluation model and practice this assessment. After instruction in each component, we will have small group practice sessions to develop a new interaction approach demonstrating an application of the concepts just learned.

BENEFIT 5: By the end of the two sessions participants will have practical experience with these three approaches, and potentially both a novel interaction to explore with new collaborators.

Course Instructor

The course is developed and delivered by m.c. schraefel. m.c. is a professor of computer science and human performance at the University of Southampton where she runs the WellthLab (mission: make better normal). m.c. is also a certified, practicing strength and conditioning coach, nutritionist and functional neurology practitioner and coach. Her research and publications in HCI are related to information systems design and health interaction, on the physiological side her research is around active mechanisms to alleviate workplace pain (list). More information can be found on m.c.'s websites www.ecs.soton.ac.uk/~mc, begin2dig.com and youtube.com/begin2dig.

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