Universal Internets: Hubs and Routers of Encounters across Difference

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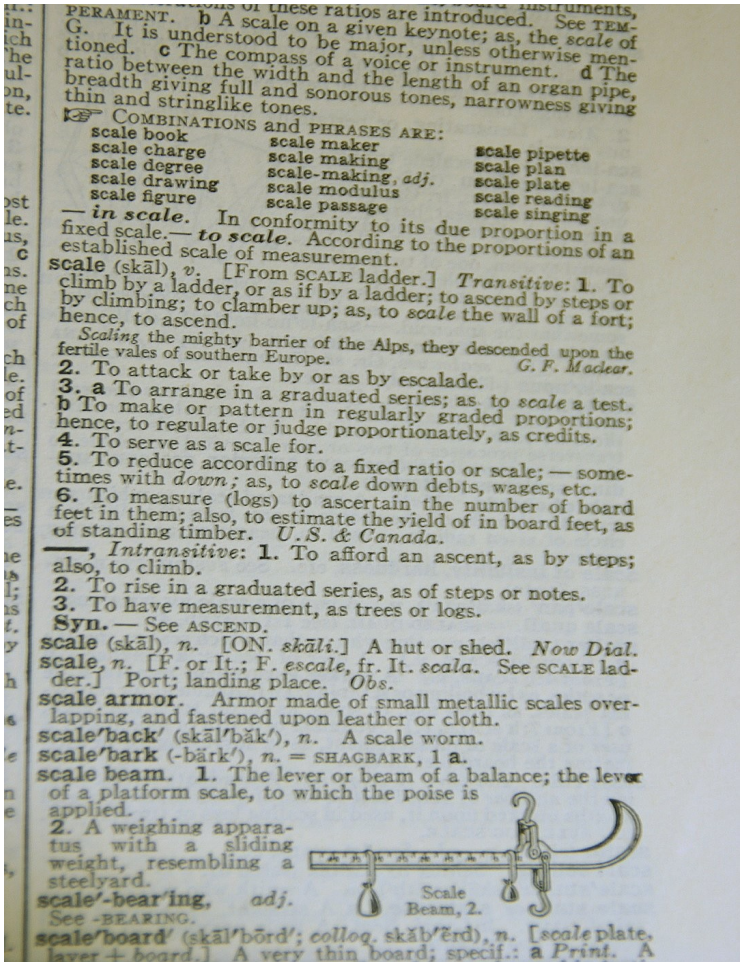
scale, n., v. *tr*

Some words seem too rich, taking more than their share of coincidence and teaching too much by their usage. *Scale* is such a word. Noun, it strings at least three distinct meanings across a semantic sea that begins with balancing machines, covers fish and snakes and crescendos with music. Verb, dictionaries generally authorize transitivity, linking the action to mountains and ladders or walls and weights. *A* scale: a shell or a cup, eight notes, a precise instrument, imbricated skins. *To* scale: a ladder, rungs spaced like marks on a ruler, a tiny train station, with tiny regular trees.



PERAMENT. **b** A scale on a given keynote; as, the *scale* of G. It is understood to be major, unless otherwise mentioned. **c** The compass of a voice or instrument. **d** The ratio between the width and the length of an organ pipe, breadth giving full and sonorous tones, narrowness giving thin and stringlike tones.

☞ COMBINATIONS and PHRASES ARE:

scale book, scale charge, scale degree, scale drawing, scale figure, scale maker, scale making, scale-making, *adj.*, scale modulus, scale passage, scale pipette, scale plan, scale plate, scale reading, scale singing

— ***in scale.*** In conformity to its due proportion in a fixed scale. — ***to scale.*** According to the proportions of an established scale of measurement.

scale (skāl), *v.* [From SCALE ladder.] *Transitive:* **1.** To climb by a ladder, or as if by a ladder; to ascend by steps or by climbing; to clamber up; as, to *scale* the wall of a fort; hence, to ascend.

Scaling the mighty barrier of the Alps, they descended upon the fertile vales of southern Europe. *G. F. Maclear.*

2. To attack or take by or as by escalade.

3. a To arrange in a graduated series; as, to *scale* a test. **b** To make or pattern in regularly graded proportions; hence, to regulate or judge proportionately, as credits.

4. To serve as a scale for.

5. To reduce according to a fixed ratio or scale; — sometimes with *down;* as, to *scale* down debts, wages, etc.

6. To measure (logs) to ascertain the number of board feet in them; also, to estimate the yield of in board feet, as of standing timber. *U. S. & Canada.*

——, *Intransitive:* **1.** To afford an ascent, as by steps; also, to climb.

2. To rise in a graduated series, as of steps or notes.

3. To have measurement, as trees or logs.

Syn. — See ASCEND.

scale (skāl), *n.* [ON. *skāli.*] A hut or shed. *Now Dial.*

scale, *n.* [F. or It.; F. *escale,* fr. It. *scala.* See SCALE ladder.] Port; landing place. *Obs.*

scale armor. Armor made of small metallic scales overlapping, and fastened upon leather or cloth.

scale'back' (skāl'băk'), *n.* A scale worm.

scale'bark (-bärk'), *n.* = SHAGBARK, 1 **a.**

scale beam. 1. The lever or beam of a balance; the lever of a platform scale, to which the poise is applied.

2. A weighing apparatus with a sliding weight, resembling a steelyard.

Scale Beam, 2.

scale'-bear'ing, *adj.* See -BEARING.

scale'board' (skāl'bōrd'; *colloq.* skăb'ẽrd), *n.* [*scale* plate, lever + *board.*] A very thin board; specif.: **a** *Print.* A

The richness of these overlapping meanings all concern measuring, spacing, evenness, overlap; figurative uses are rare. Scale shares a strange etymological connection to another decisive word abundant in the twentieth century: *test*[1]. Thus, always a pair of scales in this sense, purposing fairness, implying decision. Scales for testing evenness share the dictionary entry with the scales of fish, reptiles, sometimes butterflies. Molting, unveiling (Acts 9:18 "He removeth the scale from our eyes, the veil from our hearts."), revealing the truth. Scales of salt, metal, armor, skin also protect, though from what is not always clear. Richer by far are the wealth of uses for ladders: Jacob's holiness, an instrument's range, an arbitrary tool of amounting.

1 *test, OED, 1991.*

Somehow the binary balancing of scale pans opens out onto lines of all lengths, chopped up, finely or grossly, but always evenly. A scale of notes, scale of life, scale of intensity, bases (binary, ternary, decimal) in mathematics. The Richter scale of earthquakes, the Fujita scale of tornado intensity, the Hubble constant. Among its verbs, one can weigh and one can skin. Add to the cup or remove from the body.

This etymological crystal is cracked in the 20th century, however, when we start to see certain interesting abuses: as a noun, the scale of something comes to indicate its pure size, especially its largeness. A 'large-scale' undertaking rarely means more than a 'large' undertaking. Economics knows this use promiscuously as 'economies of scale' where fixed costs are distributed over an ever larger number of products. As a verb, a still worse permutation, a new intransitive monstrosity appears: it scales. A building and a train may be large or small may be built, as one says, to scale. But when something is *both big and small at the same time*, then *it scales*. Buildings and trains are too tangible for this intransitive miracle, it is a use of the word that could only find subjects in the twentieth century: software, markets, plans and infrastructure. Here the OED tips the balance: "To alter (a quantity or property) by changing the units in which it is measured; to change the size (of a system or device) while keeping its parts in constant proportion."[2] Scale the amount, add a zero, measure in gigabytes. What could be more familiar in the world of measurement than the convenience of exponentiation? "Does your business scale?" "Yes, our product scales," "this web server is scalable." Scalability is defined on hundreds of mailing lists, technical and otherwise. "Scalability, reliability, security" form a buzzword triumvirate second in ubiquity only to the kingly trio "products, services, solutions." Servers should scale, or succumb to too much traffic, but business plans should also scale, or risk the shame of missed market opportunity regret does not scale. An example:

> On the Internet, if you can't scale *if you can't get really big really fast* you're nowhere. And it's not enough for just your technology to be scalable. Your entire business model has to have scalability, as well; you need to be able to quickly extend your business into new markets, either horizontally or vertically. "Will it scale?" is one of the first questions venture capitalists ask.[3]

Scale is not just size: systems can be any size, but they must be big and small at the same time whether a market an economy or a business plan, whether technology or networks that scale (or in the language of the OED, 'systems and devices'). Thus have large-scale economies' become 'Economies of scale' which have become 'economies that scale' economies that digital prophets love to conjure, where markets are scaled to order and profit is pure. It s true that there is rarely ever talk of something scaling *down* rather than up growth is after all king but implied in the intransitive usage is the safety valve: should demand drop precipitously, production can match it, and profits survive. Scale is unbounded, undirected potential size.

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2 *scale,* OED, v. XIV p. 563, 1991

3 http://www.thestandard.com/ archives from January 3, 2000, my italic.

Scale-making

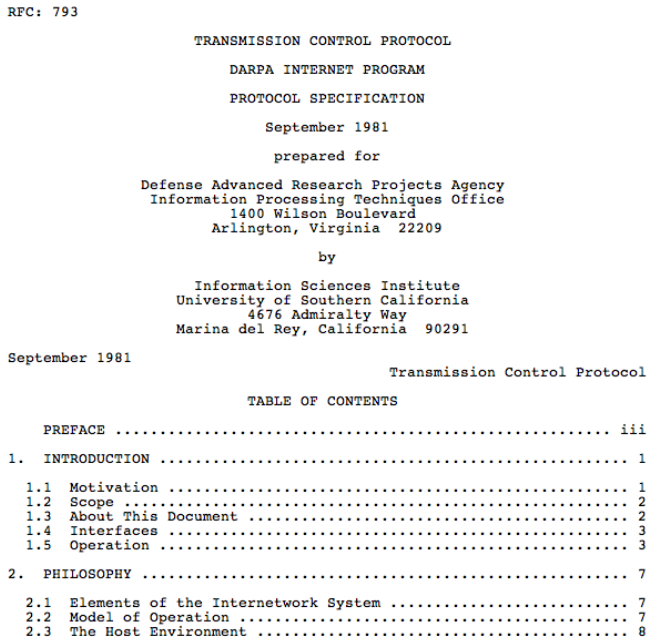
Now change the units and a different sense appears: *to make scale*. In particular, to make scale appear universal to people at different scales. This is Anna Tsing's problem: *scale-making*. Scale is a representation, an analytic operation, a model of the world. But not everyone agrees on the scale the spacing of lines, the speed of scaling, the jumps between 10 and 100 these things are all contests, worked out through negotiation and imposed through uneven distributions of power and privilege.

> "I argue that scale is not just a neutral form for viewing the world; scale must be brought into being: proposed, practiced, and evaded, as well as taken for granted. Scales are claimed and contested in cultural and political projects" (58)

Different groups see and scale the world differently but this is not comparative cosmology. Rather it is the practical negotiation of cosmologies across ill-defined boundaries cosmopolitics, to borrow from Isabelle Stengers. Different scales constantly confront one another, much the way Fahrenheit and Celsius do, but the successful negotiation allows larger and larger networks to agree, for instance, that the world is getting hotter. *Indeed, scale -making and scale-negotiation are absolutely essential to the construction of universals even as the universal hides the necessity of constructing the scale*. When a scale succeeds in pointing to a universal then the work, the friction, of making that universal appear starts to disappear.

> "Universals erase the making of global connections... How can universals be so effective in forging global connections if they posit an already united world in which the work of connection is unnecessary(7)"

For me, immersed as I have been in the Internet and the worlds of geeks, lawyers, engineers, and media activists for so many years, Tsing's description of universals and of scale-making evokes nothing so much as the fundamental problem of technical standardization, and in particular, standardized internetworking such as that represented by TCP/IP, one of the most powerful universals on the planet. Arcane standards battles of all sorts whether the successful standardization of time-zones or the world-dividing battles over voltage are one of the most concrete examples of the battles of expertise involved in creating universals. Not only do they reveal the hard work of negotiation, the labor that goes into making a scale universal, but they also reveal clearly who is left out as standards are institutionalized



RFC: 793

TRANSMISSION CONTROL PROTOCOL

DARPA INTERNET PROGRAM

PROTOCOL SPECIFICATION

September 1981

prepared for

Defense Advanced Research Projects Agency
Information Processing Techniques Office
1400 Wilson Boulevard
Arlington, Virginia 22209

by

Information Sciences Institute
University of Southern California
4676 Admiralty Way
Marina del Rey, California 90291

September 1981 Transmission Control Protocol

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and legitimated, only those who participate are admitted to universality, everyone else is condemned to either remain in the particular or accede to someone else's universal.

The Internet is a curious starting point for thinking about Tsing s*Friction* for two different reasons: 1) the metaphorical resonance between the "universal" TCP/IP protocols and Tsing s notion of the scale-making and the creation of universals and 2) the concrete relevance of the Internet (as opposed to other communication networks) to the kinds of "encounters across difference" that Tsing pursues in her book. Although I can t draw out all the implications here, let me at least touch on some themes.

The **first** concerns how universals become real that is, how they drift from ideals that permit flexible interpretation and partially shared goals, to real constraints that limit and control people at a distance (cf. Latour, Metrology). The second issue is about how the construction of universal networks has both constraining and productive effects on the kinds of "friction" that exist in the world that is, how the Internet facilitates other forms of connection and creates new forms of friction (cf. Bowker/Star/Edwards).

The TCP/IP protocols have started to become almost a totem of a certain universal: the universal ideal of an open and neutral network; engineers and activists alike evoke TCP/IP when they want to demonstrate how neutrality, interoperability and universal equality of access can be implemented technically. That is, they have come to represent far more than simply a solution to a technical problem of integration.

David Clark, Chief Internet Engineer for several years in the 1980s explained them this way: "Networks represent administrative boundaries of control, and it was an ambition of this project [TCP/IP] to come to grips with the problem of integrating a number of separately administrated entities into a common utility (55)." The need for a system that maintained autonomy of control, while at the same time allowing for resource sharing and communication determined not only the design of the system, but the *order* in which the various goals would be prioritized. Clark lists seven goals for TCP/IP:

> 1. Internet communication must continue despite loss of networks or gateways.
> 2. The Internet must support multiple types of communications service.
> 3. The Internet architecture must accommodate a variety of networks
> 4. The Internet architecture must permit distributed management of its resources.
> 5. The Internet architecture must be cost effective.
> 6. The Internet architecture must permit host attachment with a low level of effort.
> 7. The resources used in the Internet must be accountable.
>
> This set of goals might seem to be nothing more than a checklist of all the desirable features. It is important to understand that these goals are in order of importance, and an entirely different network architecture would result if the order were changed. For example, since this network was designed to operate in a military context, which implied the possibility of a hostile environment, survivability was put as a first goal, and accountability as a last goal. During wartime, one is less concerned with detailed accounting of resources used than with mustering whatever resources are available and rapidly deploying them in an operational manner.[4]

4 "The Design Philosophy of the DARPA Internet Protocols," David D. Clark in *Computer Communications: Architectures, Protoccols, and Standards, 3rd ed*. Ed. William Stallings, IEEE

Clark s focus on the ordering of goals is important for understanding why the Internet ended up looking so much different than other networks that existed throughout the 1970s and 1980s but it does not quite explain the reason why TCP/IP eventually triumphed and became the *de facto* standard for Internetworking around the globe. As a foil for the concept of "scale-making" the ordering of goals that Clark lays out is akin, perhaps, to Tsing s playful "APHIDS": Articulations among Partially Hegemonic Imagined Different Scales." TCP/IP was initially a way of massaging different projects into cooperation primarily military and academic projects, but eventually all sorts of national, corporate and amateur networks as well. TCP/IP is an articulation a protocol, specificially between administratively bounded and autonomous networks. Protocol is the right word, if you consider the idea of a diplomatic protocol: an imagined performance of neutrality in brokering an agreement between two opposing parties.

So a university network could be connected to a world-wide corporate network; a single computer could be connected to any number of university networks, etc. "Scale-making" in this sense, is respected and only the protocol for interconnection of networks of different scale is necessary.

What s important about this comparison is how the advantages of universality became apparent to individuals: as an "inter-network" the Internet brought different technologies (with different functions) and different groups of people (with different goals) into a common space of communication and control. To join, these heterogeneous groups had to make a sacrifice to homogeneity and coordination, but in return they are connected to everyone else willing to make this same sacrifice and this is part of a shared imaginary which I have called a "recursive public" because of the way it is decided upon outside of direct state or corporate control. I think this might be akin to the notion of something being "partially hegemonic."

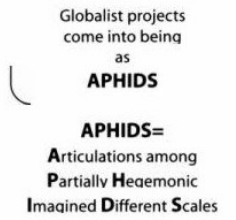

Figure 2. APHIDS. This acronym is both serious and a joke.

However, TCP/IP did not make the Internet *universal* which is to say, widespread and concrete throughout the planet; and this is where friction comes in. To understand how the Internet became a universal network and why it's universality is threatened today is a much more complex story. It involves the incredible proliferations of networks in the 1970s and 1980s, as well as a story of serendipity and struggle around the idea of open systems in the 1980s and 1990s. The reason we have one network today, instead of various military, corporate, financial, amateur/hobbyist and counter-cultural networks is not a result of the TCP/IP protocols, but they are its emblem and image.

It is also important to recognize, however, that universality can be easily undone. In the last 15 years, as the Internet has grown and become increasingly cluttered with

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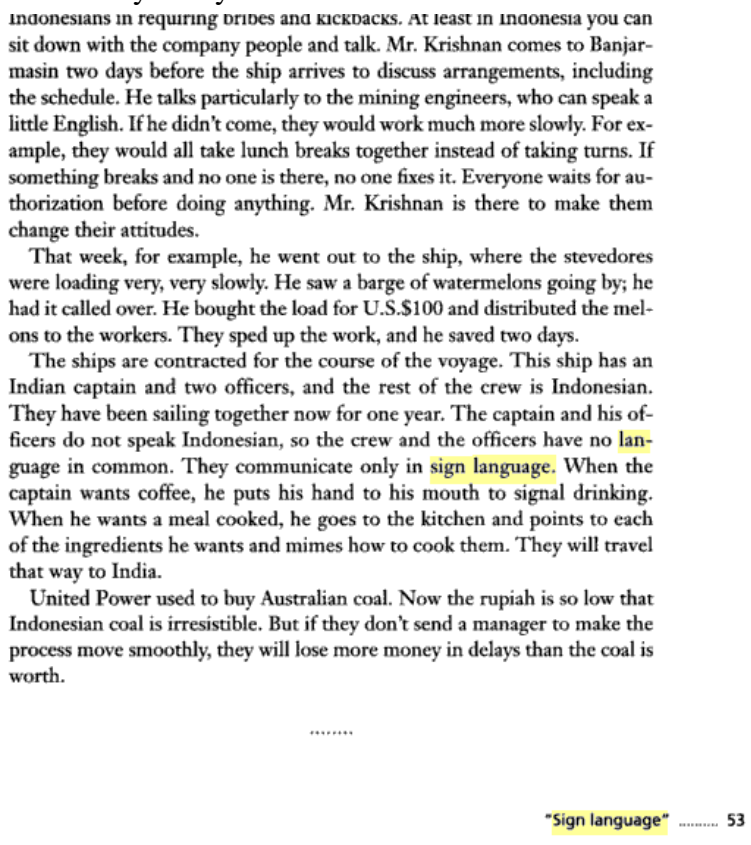
Computer Society Press, Los Alamitos, 1992. Originally in *SIGCOMM 88 Symposium on Communications Architectures and Protocols*, August 1988, pp. 106-114.

spam, traffic, security problems and moral panics various groups of people have come together to question the value of the universality of the network they range from totalitarian states concerned with national control like Saudi Arabia and China to Telecommunications companies concerned with profits (the so-called "net neutrality debate) to schools and universities concerned with resisting various onslaughts (whether corporate advertising, pornography or file sharing) to groups such as the Warumungu studied by Kimberly Christen who question the specific values of universal access, and seek forms of control seemingly incompatible with this universal.

But the fact that the Internet has become a de facto universal network is, I think also important to understanding the stories in Anna Tsing s book. The Internet as a medium for conjuring, connecting, scale-making, encountering or friction is never explicitly an object of analysis in *Friction*. In some ways, it is too prosaic email, telephones, satellite TV, wire-transfers and air-travel are all ways in which people have "encounters across difference" and sustain the connections that lead to the articulation of universals. The Internet might therefore make a quantitative difference "scope and scale" as wee like to say but not a qualitative one.

But I think this question is still open precisely because the Internet makes scales and facilitates encounters in the way it does through *inter*networking. "Encounters across difference" is a key concern in Tsing s book: the idea that universals especially global universals need to connect people across their differences in order to work. In many ways the Internet does this concretely every time a new YouTube video made in Japan is watched in Indonesia. But there are also more subtle ways in which one might track such encounters.

In *Friction*, Tsing tells a story of a ship with an Indian captain and officers and Indonesian staff who can communicate only in sign language. Why are they on the ship together? Because of various kinds of "friction" that make the abstract ideal "prosperity" translate into "getting the cheapest, highest quality coal" and thereby into "a manager needing to oversee the transport, grading, loading and shipping of the coal, in order to avoid high docking fees, in order to



Indonesians in requiring bribes and kickbacks. At least in Indonesia you can sit down with the company people and talk. Mr. Krishnan comes to Banjarmasin two days before the ship arrives to discuss arrangements, including the schedule. He talks particularly to the mining engineers, who can speak a little English. If he didn't come, they would work much more slowly. For example, they would all take lunch breaks together instead of taking turns. If something breaks and no one is there, no one fixes it. Everyone waits for authorization before doing anything. Mr. Krishnan is there to make them change their attitudes.

That week, for example, he went out to the ship, where the stevedores were loading very, very slowly. He saw a barge of watermelons going by; he had it called over. He bought the load for U.S.$100 and distributed the melons to the workers. They sped up the work, and he saved two days.

The ships are contracted for the course of the voyage. This ship has an Indian captain and two officers, and the rest of the crew is Indonesian. They have been sailing together now for one year. The captain and his officers do not speak Indonesian, so the crew and the officers have no language in common. They communicate only in sign language. When the captain wants coffee, he puts his hand to his mouth to signal drinking. When he wants a meal cooked, he goes to the kitchen and points to each of the ingredients he wants and mimes how to cook them. They will travel that way to India.

United Power used to buy Australian coal. Now the rupiah is so low that Indonesian coal is irresistible. But if they don't send a manager to make the process move smoothly, they will lose more money in delays than the coal is worth.

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"Sign language" 53

maintain the profit margin" which translates into needing an Indonesian ship and captain, and Indian employees. As a result the crew and officers communicate only in sign language a protocol of sorts that allows them keep to themselves, each experiencing the voyage as a (relatively) beneficial situation but nonetheless communicate the minimum necessary to make the ship sail from Kalimantan to India.

The Internet might be thought of as just this kind of sign language it does not cause people to come together, but fills in the space between different groups with a common enough language; it lubricates and facilitates; it provides people a way to work around the friction that Tsing sees so clearly in such examples.

The obvious aesthetic appeal of this ethnographic anecdote is similar to that of the Balinese Cockfight: in the fact that these ship mates mime their desires to each other in a bizarre dance orchestrated by necessity one can unfold the operation of multiple scales, and multiple vectors that make up a universal, albeit fragile, market in coal. But just as the cockfight is not Bali, but an analytic tool for revealing certain aspects of Balinese life, so too the sign language, or the Internet, are not the global itself, but tools for revealing how the idea of a universal prosperity, knowledge, freedom awkwardly and unexpectedly come into being in "out of the way places."

Conclusion: Friction as concept, model, trope

I want to end on a more contentious note: is friction a universal? By this I don t just mean, is there friction everywhere that universals are constructed, to which I think the answer must be yes. Rather, I am wondering whether "friction" and the associated claims about the creation of scales and the formation of universals is in fact a *concept* that anthropologists might consider to have the same structure and function that something like *markets* or *social justice* do in the places Tsing has been?

I can imagine three ways in which "friction" functions:

1) as a metaphor or trope that responds to a rhetorical and semantic field: contra flows and scapes and seamlessness and flatness and the language of fluid capitalism that overlooks or ignores the kinds of work that are so poignantly and painfully obvious in any on-the-ground setting around the world.
2) as a model, which is to say, as a *scale-model* of a process happening in the world. Rather than a model of globalization, as a structure independent of humans, it is a model of human negotiations and practices that aim at universalizing something creating and growing markets in forest products for instance, or bringing together activists around the globe for the purpose of contesting these markets. In short it is a name for the on-the-ground messy and unanalyzed practices that will be identified as "capitalism" or "social movements" only after they have become successful.
3) As a "concept" which is to say, something more like a universal. A tool that doesn t emerge from or belong to Tsing, but is intended to spread and garner allies in a more general analytical approach to studying "global connection"-- as

something that any anthropologist might take into the field and use as a tool to uncover certain kinds of relationships, and which might then be transformed and refined as a result.

Of course, these three uses are not mutually exclusive but they do point to what I think of as a problem in anthropological scholarship: namely, whatever work is necessary to make markets, prosperity, capitalism, freedom, social justice or knowledge into universals, surely it must be harder than the work necessary to make an anthropological concept into a universal? Why then do we have so few of them? Are we so terrified of participating in the networks of capital that we can only imagine our work as so many bespoke critiques of existing states of affairs? By what logic does the "branded trope" (as in the usage "What Anna Tsing calls friction ") become a universal concept? What kinds of "scale-making" are we engaged in, and with whom are we having "encounters across difference?"