Cultural Arithmetic
A Mechanism for the Natural Recurrence of 23

Introduction

That the number twenty-three (23) is one that can be reasonably characterized as 'naturally recurring'[1] is not the topic of this article; no defense of this statement will be attempted, as I take it to have been already satisfactorily empirically demonstrated[2,3]. My aim here, rather, is to provide an explanation of this seemingly arbitrary phenomenon. Clearly, it is important that we understand what is meant by 'naturally recurring number' (NRN): as I will use this term, it signifies a number with the property of strangely appearing in everyday lives (of inhabitants of contemporary European-American-ish culture) more often than any other (in the judgement(s) of people who fit this category). Thus:

Empirical Postulate: 23 recurs naturally .

Now, on to our central question: Why should this be so? Why 23 and not, say, 17 or 42 or 1024 or any other number? My proposal is this: first, that *some number* will inevitably be regarded as naturally recurring, and second, that cultural factors conspire to make 23 the most probable number to fit this category. My strategy in answering this question, then, will be to provide a series of culturally founded axiomatic constraints on the existence and identity of this most special number; two types of analysis will then be employed to generate from these axioms the most probable candidate(s) for NRN status. If 23 is the candidate that results, the project will have succeded.

Axiomatic

Axiom 0: Some particular number (or small set of numbers)
will inevitably naturally recur.

This most basic axiom is founded on two premises: first, that the large, large majority of European-American people are entrenched in a complex culture where numerical situations are very common, and second that these people have been trained to learn about their world by recognizing patterns within it.

Institutions of contemporary mass culture find it increasingly necessary to categorize things into certain number ranges. The sizes of things counted in our culture, and the cultural conventions that govern *how* they are counted will influence what these ranges are and how they overlap.

Every number has *some* chance of appearing in a given numerical situation, and each such situation has a unique characteristic distribution of appearance-probabilities across 'the numbers'. There is no reason to believe that these distributions are independent from one another and hence that a mean probability distribution will be uniform. On the contrary, given the complexity of modern cultural numerical constructions and their interrelations, it makes sense that one particular number, or a small set or range of them, will emerge as having the highest probability of appearing in everyday lives. Identifying that number is a matter of generalizing these cultural constructions; this is what we attempt here.

Example: Karen (a generic, Euro-American culturally-informed human being for the purpose of the following examples) enters into many numerical situations every day. As she checks a radio station with a particular frequency to see what the temperature will be on this particular date, glances at license plates on her way to class, figures out how many minutes are left in the boring lecture she's enduring, dials her friends' phone numbers, finds a club by going to the right (numbered) street and watching the addresses converge on her destination, counts money out to pay the cover, and finally glances at her clock as she falls asleep, numbers from a variety of different culturally enforced ranges appear to her. Since these ranges are not unrelated and Karen learns by pattern recognition, she gradually comes to experience certain numbers as more common than others in her life, though she's not sure why. This is the notion of the NRN.

Axiom 1: An NRN (naturally recurring number) will not be found outside the whole numbers (that is, the nonnegative integers).

This axiom removes from consideration the vast majority of numbers, for two reasons. First, these (imaginary, complex, negative, irrational, fractional, etc.) numbers exist primarily in the domain of mathematics and are encountered far too rarely in popular culture to naturally recur.

Example: An infinity of complex, irrational and negative numbers never enters popular usage. Since Karen doesn't run into these numbers outside of mathematical discourse, they never have the chance to be recur.

Second, even if we assume that a non-whole number might be seen with a frequency anywhere near that required to naturally recur, a whole number reduction of it would surely recur instead, such is our cultural familiarity with whole numbers.

Example: 4+13i, -26 and e=2.71828... manage, through an extreme force of will, to escape from a mathematics textbook and are found walking around in popular usage. When Karen encounters these numbers repeatedly, she is more likely to be left with the impression that, say, 13, 26 and 27 are popping up all over than to remember the 'specifics'; these specifics thereby disqualify these types of numbers from NRN candidacy.

Axiom 2: An NRN cannot be greater than 99.

Axiom 2 disqualifies numbers above 99 from NRN consideration, first simply because 100 is big. Numbers over this boundary will culturally be used less often than those below it: we count things with numbers in the 0-99 range far more often than those in any other. Also, these numbers are easier to remember because of their small size—human pattern recognition has limits, and numbers with three+ digits will be re-recognized less often than two-digit numbers.

Example: Karen encounters, in a financial report, the numbers 2148, 17483 and 9954856. Since she doesn't remember them for more than a few seconds and never sees them again, they cannot recur.

Another argument: NRN candidates should be composed of fewer than three digits, to maximize their chances of occurence in random number strings. Any particular three-digit number is ten times less likely than any particular two-digit number to appear randomly in such strings. (And, obviously, each digit added above three makes the resulting candidate ten times less likely again.) This is an important consideration, since modern culture dictates our encountering (relatively) random number strings all the time (telephone numbers, social security numbers, credit card numbers, postal codes, etc.) In addition (as above), keeping candidates to two digits also maximizes our chances of recognizing them in these long strings.

Example: Karen encounters, in a financial report, the numbers 2148, 17483 and 9954856. She is surprised to notice that the string ‘48’ occurs in all of them. Random chance has here put 48 (possibly) on the road to recurrence.

Axiom 3: An NRN cannot be less than 10.

Numbers less than 10 occur far too often (that is, everywhere) to recur since they are the digits on which our whole number system is based. Now a critic or confused reader might object that we are eliminating, in our search for a number that occurs often, the ones that occur most often. This illuminates a crucial point: *an NRN is not simply a number which occurs more often than any other, but one that “strangely appears”, that seems somehow obscure and arbitrary enough that we are surprised when it does repeatedly occur.* Being an NRN means negotiating a careful balance: such a number must appear often enough to reasonably be considered recurring, but not often enough that it becomes a significant player in the cultural lexicon and consequently is disregarded. The mechanism of its recurrence must be so subtle that we don’t notice its action, only its result. The digits clearly do not meet this criterion.

Example: Karen is unlikely to be surprised when she sees the number 3 over and over again in her daily life.

Axiom 4: Round numbers (ending in 0 or 5)
will not recur naturally.

This axiom’s defense follows the same logic as Axiom 3: in our 10-based number system, numbers such as 10,15,20,25,... are considered ‘round’ and used far too often (particularly in estimates and approximations) to be NRNs.

Example: Because she uses and hears phrases like ‘around 10 feet’ and ‘20 or 30 times a year’ all the time, Karen is unlikely to be surprised when she sees these numbers over and over again in her daily life.

The next two axioms focus in on the numbers that will seem most strange to us, as discussed above:

Axiom 5: While the one-digit primes 2,3, & 7 are not NRN candidates,
they are more likely than other numbers to occur in an NRN.

Of the digits, 2,3 and 7 have often seemed most basic/simple/essential (something the non-primes lack) without being redundantly so (as 1 is), or central to the base-10 structure (as 5 is), as evidenced by human cultures that have mystified them with numerological significance. These digits will be found most evocative, most unusual, most arbitrary.

Axiom 6: NRNs are most likely to be prime, or seem prime
(that is, be odd, with no repeated digits).

Much like the prime digits, prime whole numbers may seem more obscure than even numbers and obvious multiples—seeming rare, repeated exposure to these numbers would be a breeding ground for NRN candidates.

The next two axioms characterize the numbers that will occur most frequently:

Axiom 7: The lowest digits (1-5) are most likely to occur in an NRN.

The digits one through five are most often used for counting very small things: studies have shown that the highest number of things countable by the human eye/brain on sight is five. Thus these digits occur most often in counting-very-small-things situations; when juxtaposed, combinations of these situations could create a surprising occurence of the NRN candidate. 6-9 will occur less often in these frequent situations, so things they combine to form are less likely to be NRNs.

Axiom 8: NRNs are most likely to occur between 20 and 30.

The twenty-thirty range is at the confluence of two important ranges: the range zero-thirty, used for counting small groups (books on a shelf, days left in a month, dollars in a pocket, hours in a day, years in a generation, floors in a building, etc.); and the range twenty-sixty, used for counting medium-sized groups (pages in a notebook, dollars to buy something substantial, people attending a gathering, cents to buy something small, etc.) The intersection of these two ranges is the range 20-30, most likely to appear in both types of situation. (A real fix on this important result range would require an exhaustive survey of all small and medium-sized sets used in daily life, which has not been done. The ranges have to be a rough approximation.)

Qualitative Analysis

On this analytic model, we take Axioms 1-4 as inarguable and add into the system different combinations of Axioms 5-8. Each axiom operation is listed, along with the set of NRN candidates generated. Each section also shows the union of sets generated by the addition of each number of axioms; that is, the set of NRN candidates obtained by all observers adding in each number of axioms.

Axioms 1,2,3,4 → (11-99) - {15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90,95}

Adding in one of Axioms 5-8:

+5 → {22,23,27,32,33,37,72,73,77}
+6 → {11,13,17,19,23,29,31,37,41,43,47,53,59,61,67,71,73,79,83,87,89,91,97}
+7 → {11,12,13,14,21,22,23,24,31,32,33,34,41,42,43,44,51,52,53,54}
+8 → {21,22,23,24,26,27,28,29}
∪ = {11,12,13,14,17,19,21,22,23,24,25,26,27,28,29,31,32,33,34,37,41,42,43,44,47, 51,52,53,54,59,61,67,71,72,73,77,79,83,87,89,91,97}

Adding in two of Axioms 5-8:

+5&6 → {23,37,73}
+5&7 → {22,23,32,33}
+5&8 → {22,23,27}
+6&7 → {11,13,23,31,41,43,53}
+6&8 → {23,29}
+7&8 → {21,22,23,24}
∪ = {11,13,21,22,23,24,27,29,31,32,33,37,41,43,53,73}

Adding in three of Axioms 5-8:

$+5\&6\&7 \rightarrow \{23\}$
$+5\&6\&8 \rightarrow \{23\}$
$+5\&7\&8 \rightarrow \{22,23\}$
$+6\&7\&8 \rightarrow \{23\}$
$\cup = \{22,23\}$

Using all 8 axioms:

$+5\&6\&7\&8 \rightarrow \{23\}$

Quantitative Analysis

On this analytic model the axioms are weighted according to their power to remove from a number its potential NR (natural recurrence). Each candidate number is first assigned an NR potential of 100. The axioms are then allowed to operate on each number (in a subtractive manner), and the candidates are ordered by how much NR is left.

Axiom No.	Weight
1	100
2	70
3	60
4	50
5	15 (both digits non-{2,3,7})
	10 (one digit non-{2,3,7})
6	15
7	10 (non-prime; composite odds)
	20 (non-seems-prime; even or repeated digits)
8	20

NRN candidate	NR index
23	100
27	85
21	80
22	80
24	80
29	75
13	70
31	70
43	70

Concluding Comments

As human animals and inhabitants of certain culture institutions, we have a tendency to subconsciously search for a naturally recuring number, and the variety of existing constraints on the identity of this number tend to prefer 23. This explains why 23 has so universally been assigned this role. As the qualititave analysis shows, a special strength of 23 is the support it receives from so many independent axioms; if some are rejected (to allow for different cultural constraints) 23 is still often the only remaining candidate. Inhabitants of different subsets of Euro-American culture will probably have slightly different constraints, yet 23 might still emerge as a common NRN.

The approach adopted here allow for multiple NRNs. Some set of people might experience the same cultural constraints, yet support another NRN. Our result is simply that 23 is the most probable NRN, and so it will occur more often than any other when these cultural constraints are present.

Of course, different cultural constraints will naturally give different results – work in this area would no doubt be very enlightening. An additional area of further study: what happens when a number is recognized as an NRN? Might such recognition eventually normalize the number to the point where it cannot qualify as an NRN? Probably—anyone interested in maintaining 23's NRN status, would be well advised to guard this text closely.

Brent Emerson
Providence, RI / Salt Lake City, UT / Oakland, CA
March 1997, April 2001

Acknowledgements

Thanks to Simon Fillat and Kenneth Loosli for help finding references to Illuminati-style sources, and to the rest (Amy Morris, Jeff Odell, Alex Hart, Jessica Gezon) for keeping me in touch with the 23.

Notes

1. Given the approach of this paper, 'culturally recurring' would probably be more accurate, but I'll stick with the original terminology for now.

2. Historically, the Illuminati understood 23 as a mystical number—this is closely connected with their emphasis on the "Law of Fives". (Original sources escape me; for a more recent (sometimes parodic) discussion, see Robert Anton Wilson's *Illuminatus* trilogy, especially the appendices to <u>Leviathan</u>.) 23 days is said to be held by the Tantric Buddhists as the length of the 'male sexual cycle'. Several popular authors, including Wilson and Tom Robbins, have co-opted mystical sources like these and preferenced 23 in their writings. Many more historical and modern-day references to 23 can be found all over—see below.

3. As of this writing, there exist several websites devoted to the mystical nature of the number 23 and its natural recurrence. (See http://www3.clever.net/2ask/syn23/m_23.html, http://www.impropaganda.com/~street/detour/23.html.) The actual volume of references (at these sites or elsewhere) to 23's recurrence in everyday life, while impressive, is not necessarily as relevant to 23's status as an NRN as the very fact of the existence of several sites for their collection; a superficial search reveals no similar sites for other numbers.