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BY CRAWLS AND CREEPS

The layman is apt to think that science progresses by leaps and bounds, where each leap and every bound is a straight successor to whatever has gone on before. To the uninformed, there is a simple unbroken succession from Newton to Lorentz to Einstein. Similarly, even to the educated, Dalton's atomic hypothesis leads naturally to Rutherford's first atomic transmutation and thence to Hiroshima and beyond.

To those active in the field, nothing could be further from the truth: they are aware that science proceeds by crawls and creeps. Science, notably in its more exact parts, has indeed progressed but almost never by the clear steps one fondly imagines. For one instance, reliable information has it that even Isaac Newton took twenty years to derive the truth that, under an r^{-2} law of attraction, a sphere could be represented as though all its mass were concentrated in its center. Nowadays, of course, Newton's reasoning can be condensed into about 8 lines of calculus. Yet the sad fact is that Newton repeatedly delayed publication of his *Principia* because of his failing to prove this theorem now considered to be elementary.

Similarly and definitely not claiming to be in Newton's league, the path of improving chess knowledge, even when reputedly enshrined in infallible computers, is not straightforward either. Rather, progress is very much in the way of the Echternacht jumping procession: three steps forward, two steps back. We have a case in point to draw our readers' attention to: closer scrutiny of an endgame as apparently simple as KBBK has revealed miscounts on the parts of several distinguished authors which science, progressing by forward leaps and backward bounds, is now slowly moving to correct. Moreover, as previous estimates are improved upon by laborious searches, it turns out that prior approaches have been naive: by exploiting symmetries to the utmost in order to save precious computer time, they had overlooked essentially different positions by recklessly identifying them. Later, it transpired that symmetrically-related positions were distinct rather than identical.

The present issue reverberates with the idea of progress being non-linear, but rather of a fractal nature: for every forward leap, there seem to be minor rebounds. The most striking example, of course, though on a mundane level, is our own contribution. At a more philosophical level, A.D. de Groot's article provides one more instance. His contribution thoughtfully contests the now almost universal claim that in some teens of years computer-chess programs will vanquish the World Champion. In essence, the issue is about what is fairly described as *intuition*. Herbert Simon is taking a reductionist view of the notion of intuition, viz. a facility providing access to information stored in Long Term Memory. De Groot disputes this: while not denying the impact of access to Long Term Memory, he maintains that intuition is a productive (i.e. unpredictable) procedure, thus well over and above Simon's reproductive approach. Hence, even at this exalted level, the conflict is restated: which authors are right? Are they those, like Simon, going by bold leaps or are they those, like De Groot, who notice every potential bound and rebound, even when they are not in a position to judge the impact of what they have noticed?

The papers cited above will provide the reader with some examples of undecidability or at least of the difficulties besetting that notion. The paper by David Slate provides another case in point. Though he needs no introduction from us, having gained the 1977 Computer-Chess World Championship with his program Chess 4.6, his thoughtful article can be read as an attempt to come to terms with the excruciating decision when to retain a position and its consequences (because it is likely to impact and accelerate decisions) and when to reject its future use. Again, the decision is not straightforward and every single instance of retention or rejection is beset by the difficulty of weighing forward leaps against possible backward bounds.

As they say, "Old soldiers never die"; in our case they do not even fade away, since De Groot is alive and kicking the shins of his opponents. Yet, Dap Hartmann, who is in the midst of a large project extracting Grandmaster knowledge in order to apply it to computer chess, far from proving De Groot and other pioneers to be obsolete, rationalizes their intuitions so as to be testable by computer. Such testability involves either verification or falsification and, to your Editors, the wonder of the matter is that, working some forty years after De Groot, Hartmann essentially *verifies* De Groot's results. Of course, since he had some 150 times as many positions to work from as De Groot, the verification naturally involves a reliable sharpening of his predecessor's results. To the thoughtful reader the ambiguity of definition, even for such a seemingly simple notion as *mobility* will be a preponderant issue in Hartmann's article. Though correlations are large, Hartmann justifiably has his doubts on the best definition to employ, thus adding one more ingredient to this issue's central theme: the difficulty of deciding among relevant notions.

Bob Herschberg
Jaap van den Herik