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Raising the Hurdle for the Athletes' Mars Effect: Association Co-Varies With Eminence*

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Abstract—By 1955, Michel Gauquelin had begun to publicize the claim that famous athletes are born with frequencies far beyond chance at times when Mars is rising over the Earth's horizon ("key sector I") or when the planet crosses the meridian ("key sector II"). Critics did not succeed in refuting this claim empirically: The "Mars effect" survived three such attempts. It was largely doubts over the impeccability of M. and F. Gauquelin's data base, however, which kept researchers from pursuing the problem further. The present study incorporates the entire repertoire of birth data of athletes available to date (N = 4391). The objective is to test the alleged planetary correlation as a function of degree of sportive eminence, the latter being determined by citation counts. It is contended that this procedure is superior to Gauquelin's own; and that the predicted eminence function could hardly be expected to materialize in case his former results were due to biased data treatment. Findings corroborate the eminence prediction: The proportion of athletes born at Mars key sector hours increases from the lowest to the highest of five ranks of sporting eminence; the trend is highly significant ($p < .005$) by several criteria. It is concluded that Gauquelin's hypothesis, after having passed this crucial examination, deserves the most thorough attention.

Introduction

From 1955 on, Michel Gauquelin has been claiming to have evidence for a perplexing "astro-psychological" relation: Frequencies of births of eminent professionals are said to deviate from chance expectation in particular ways. Athletes, for example, are allegedly born more frequently than expected by chance when Mars is rising over the Earth's horizon (i.e., when the planet transits "key sector I") or when it passes the meridian ("key sector II," see

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* *In memoriam* George A. Abell († Oct. 7, 1983) whose "sincerity, honesty" and whose "respectful manner" of treating the principle victim of the previous Mars effect drama was explicitly noted by Piet H. Hoebens. And, *in memoriam* Piet H. Hoebens († Oct. 22, 1984) who wished that CSICOP would soon get "a chance to prove that the Mars effect fiasco has indeed been an isolated lapse."

"There are lessons which I am sure all of us involved have learned very well: When investigating an allegedly paranormal claim, we must take it seriously, think of it thoroughly, use professional care, as we would in real science . . ." (G. A. Abell in his "epilogue," addressed to "actors, producers, and drama critics," May 1st, 1982).

Figure 1). Gauquelin offers a detailed account of this anomaly as well as of the methods used to ascertain its existence in this same issue of the Journal (Gauquelin, **1988).** The present contribution deals with the second in a series of attempts to test the supposed association in a more rigorous manner. (For the first study, see Ertel, **1986.)**

For what follows, it is necessary to divide Gauquelin's assertion into two. The first is the more general one, namely, that there are relations between planet key sectors and certain professionals' births at all. The second specifies that the **association becomes** more pronounced as professional achievement increases. The latter proposition is stronger than the former and more consequential, thus preferred for a critical test. If substantiated, it would, by implication, be tantamount to confirmation of the first claim as well. **Likewise,** its **disconfirmation** would seriously weaken the first claim to which the second has been closely linked. Testing the first hypothesis without regard for the second could not yield equally convincing results.

A critical survey of previous investigations by skeptic observers of **Gauquelin's** work may attest to the usefulness of this reasoning.'

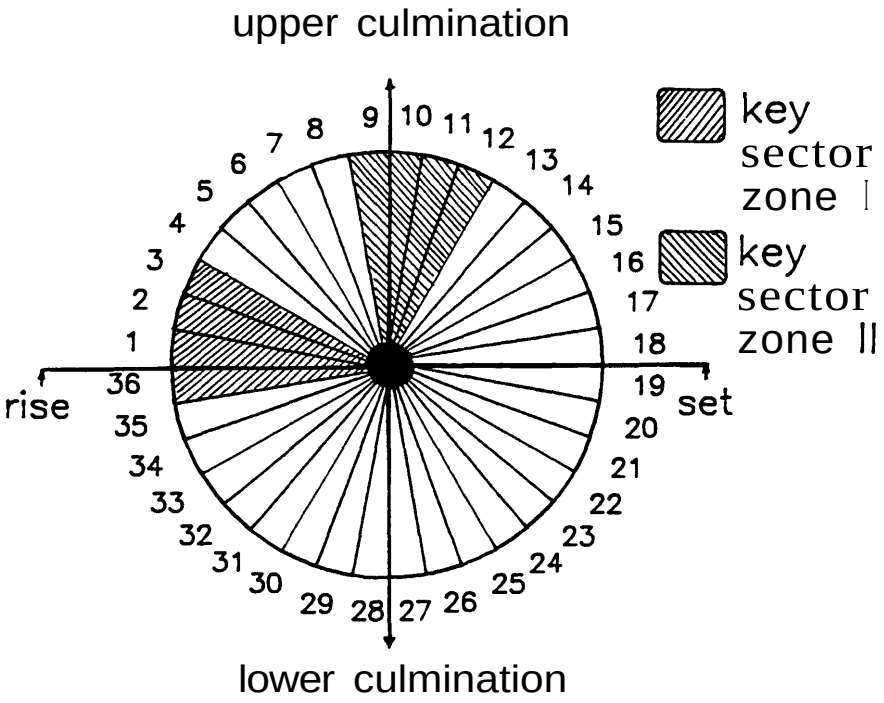

Fig. 1. A 36-sector arrangement for plotting the apparent daily movements of heavenly bodies. Sector nos. 1–18 define motion from rise over the Earth's horizon to setting; sector nos. 19–36 apply to motion beneath the horizon. Sector nos. 36, 1–3 (zone I) and sector nos. 9–12 (zone II) are called key sectors; planetary positions in these zones are claimed to be correlated with birth frequencies of certain professionals.

Evaluation of Previous Attempts

The Zelen Test

The first of Gauquelin's claims has been subjected to the "Zelen test." Zelen's approach circumvented certain statistical complications, in the context of obtaining theoretical key sector frequencies, which had been elaborated by the Belgian Para Committee (1976). Following Zelen's design, birth hours of controls drawn from the general population were tallied (N = 16,756). The controls had been matched for date and place of birth with 303 athletes drawn from the data pool of Gauquelin's champions (N = 2088). For the subsample of 303, the proportion of athletes born during key sector passage of Mars (= key sector-proportion, kS) was ${}_kS_e = .218$; ("e" for experimental subsample). This value was thus representative of key sector proportion of the total (${}_kS_E = .217$; "E" for total experimental sample; see Gauquelin & Gauquelin, 1977).

Zelen's test sought to obtain one empirical information only: ${}_kS_C$, that is, the key sector proportion for the matched control group ("C" for control). Comité Para and those who took their side in this investigation, predicted ${}_kS_C = {}_kS_E = .217$. After having equalized astronomical and demographic conditions of C with E, and in the absence of Mars correlation, ${}_kS_C$ should not differ from ${}_kS_E$. Gauquelin, on the other hand, using his standard procedure for calculating theoretical key sector-proportions (${}_kS_G = .167$; "G" for Gauquelin procedure) predicted ${}_kS_C = {}_kS_G = .167$.

Zelen obtained ${}_kS_C = .164$ for the controls, that is, Gauquelin's procedure of calculating theoretical kS proportions had stood the test. To quote A-K-Z: "The results of the Zelen test suggest that Gauquelin adequately allowed for demographic and astronomical factors in predicting distribution of Mars sectors for birth times in the general population" (A-K-Z, 1982, p. 82).

Michel and Françoise Gauquelin concluded that the Mars effect had been corroborated; the difference of key sector proportions between experimental and control group ${}_kS_E - {}_kS_G = .218 - .164 = .054$, which was shown to be highly significant, could no longer be attributed to some hidden astronomical-demographic mediation.

A-K-Z, on the other hand, were not inclined to endorse the Gauquelin interpretation at this point—the reason being that, "We were not sure that the sample selected by Gauquelin was unbiased" (A-K-Z, 1982, p. 80). It is not unreasonable to regard the Gauquelin interpretation as not compelling since Zelen's test was to find evidence for an artefact of the kind Comité Para had suspected. It did not, at the same time, rule out another alternative which could possibly explain the Mars peculiarity, namely selection bias and/or data fraud.

The athlete population (N = 2088) from which the subsample of N = 303 had been drawn, contained 1553 champions selected entirely by Gauquelin himself (the remainder under the supervision of Para Committee). Although inspection of Gauquelin's archives (by P. Kurtz), and some scrutinizing of

his statistical methods (by R. Chauvin, E. Scott, D. Rawlins) had not supported suspicion of problems in this regard, the immense weight of the Gauquelin claim which—to use Abell's words—"would lie beyond anything that science can at present understand" (Abell, 1982, p. 7) is ample grounds to maintain, as long as possible, less incredible explanations of those results: For example, "We can imagine ways that bias could have entered without intentional cheating" (Abell, 1982, p. 11). The point is clearly phrased in Kurtz and Abell's final comment on the Gauquelin issue: Uncertainty remains concerning the objectivity of his original data selection. (And) "that is why we cannot confirm the significance of his statistical analysis supporting the 'Mars effect'. This is ... the crux, and perhaps the Achilles heel of the 'Mars Effect' dispute" (Kurtz & Abell, 1983, p. 88).

In their first report on the Zelen test, however, A-K-Z did not yet address the essentials. Instead, they were preoccupied with doubts concerning the objectivity of Gauquelin's selection of his experimental subsample. They pointed to some seemingly disturbing variability of kS proportions within this group of 303 athletes.

The question of sample homogeneity, although meriting a study of its own, was actually beside the point. To the extent that it is deemed relevant at all, the total population of athletes should be divided into meaningful subgroups in order to look for internal variance. Moreover, heterogeneity in the athletes' sample chosen—if it was heterogeneous-does not necessarily mean lack of sampling objectivity.[2] Finally, inferential statistics were applied ad *hoc* and not always with the necessary care. Criticisms were justified: Twenty-one contributions to the Mars effect dispute were published in *Zetetic Scholar,* Nos. 9 (1982), 10 (1982), and 11 (1983). The majority raised objections. In their reappraisal six years later, A-K-Z did their best to set the records straight.

The U.S.-Athletes Study

There are two approaches to the bias or fraud problem in accounting for the Mars anomaly. The first is Gauquelin-independent replication. This strategy led to K-Z-A's study of U.S. athletes. The second is Gauquelin-independent analysis of Gauquelin data. This strategy led to the study reported below.

K-Z-A's study with U.S. champions was a hopeful next step. However, the researchers committed errors of their own, the most critical being that they did not take Gauquelin's eminence tenet seriously enough. They did not try convincingly to select highest ranking athletes. No "bickering" (Abell) would have occurred as to whether or not the individuals listed in the four *Who's Who* volumes consulted there, were sufficiently eminent if CSICOP's data assemblers had tried in earnest to optimize their sample (see Ertel, in press-b).[3] A-K-Z, in their reappraisal, regret that they "had not obtained in advance a clear understanding with the Gauquelins on exactly what they were predicting and what directories of famous sports champions

would be satisfactory according to their hypotheses . . . there were no written agreements" (A-K-Z, 1983, p. 81). The authors could have regretted still more: They did not give the alleged effect the best possible opportunity for revealing itself—if it does exist—or for being shown a product of Gauquelinean data shuffling if that was really what it was. K-Z-A failed to come to firmer conclusions because they focused on the *first*, that is, the less specific of Gauquelin's claims. Testing the second claim with appropriate precision, therefore, would appear to be a more promising approach.

The Eminence Study

The Study Objective

The hypothesis to be tested is this: The relative tendency for athletes to be born more frequently during kS-passages increases monotonically with their level of sporting eminence.

Gauquelin himself did not scale athletic success beyond two levels. In four studies (1955, 1960, 1979, 1982) he distinguished at most between more and less generally successful figures. He dichotomized the groups by ad *hoc* criteria which did not always meet the standards of objectivity. Moreover, he would change criteria from one study to the next—this procedure was also criticized by A-K-Z in their "Contradictions" article (1980).

Gauquelin's lack of rigor in determining eminence, however, turns out to be an advantage for the present purpose. The rationale here was to create conditions that would logically exclude an explanation of positive results in terms of Gauquelin's data handling. Eminence will be objectively defined by frequencies of citation. If the Mars effect is real and if eminence is adequately reflected in citation counts, then a systematic increase of kS-percentages (kS%) with eminence must be observed.

Such an increase of kS% with eminence could hardly be attributed to Gauquelin's selection technique. One may of course still imagine that the "effect" can be obtained, in principle, by fudging. A cheater might secretly count citations and then "inject" carefully dosed data of individual athletes with appropriate Mars positions, while discarding others with inappropriate positions. Accordingly, kS%-values could be intentionally altered so as to "properly" co-vary with citation counts.

The technical requirements for such a fraud would be immense, however. At the time of Gauquelin's athletes work there were, for one, no personal computers. More important still would be the psychological contradictions inherent in such an operation. Supposing a fraud was in fact committed, the cheater would have gone public with its outcome and would hardly have waited for decades hoping for someone else to come across the product of his surreptitious activity. It is difficult enough to give credence to a "Mars effect" to begin with. Yet to assume that any investigator would spend a lifetime faking data while at the same time trying to camouflage the very masterpiece of this undertaking is hardly less unbelievable.

The Data

All athletes data available were gathered for the study, that is, birth and associated Mars sector positions, the total amounting to N = 4391. Considering the atmosphere of suspicion in Mars effect discussions, particular transparency of method is called for in this instance. The following description of the present material is, therefore, rather detailed. Specific features of the samples are noted in Table 1. (For their contributions in terms of numbers see column G.) Asterisked entries involve notations. The letters in parantheses in the following paragraphs refer to Table columns.

Comments on Entries of Table 1

1: "First French." (E–G) The data were first published without planetary sectors data, in an appendix to IA, 1955. The section was headed "570 sportifs" (the number of athletes actually listed was 568). The data were again published, with planetary sectors, in A1 (1970), with one deletion (an erroneous birth date; M. Gauquelin, personal communication, May 10, 1986).

(J) No subdivisions by sporting success are found in this study; rather, Gauquelin dealt with distinctions among sporting categories or areas, including: cyclists, boxers, team athletes, soccer players, and "other athletes," for special analyses.

2: "First European." (D–G) Gauquelin analyzed a sample of 915 non-French European athletes in his HA (1960) study. The data, however, were included only in the A1 collection (1970). Between 1960 and 1970, casual data gathering for European athletes continued (N = 274). Subsample No. 2 increased in size to N = 1189.

(J) Success was considered here. Seventeen biographical sources were used. Fourteen of those were regarded as listing athletes of renown. Athletes taken from three sources (German) were regarded as less renowned (N = 117) ("because criteria for selection were missing" p. 262). For one source (the Italian soccer *Almanacco),* Gauquelin used *a* breakdown; Those who played at least once on the national team were classified as renowned (N = 98), and those who never advanced to the national team were judged less renowned (N = 600). This information came directly from *Almanacco.* Apparently, the selection was objective.

3: "Italian Soccer." (E) The data of "less renowned" players were not published. Gauquelin gave this author permission to take the original index cards back to Gottingen University for manual transcription.

(J) (see comments on Italian soccer in 2-J, above).

4: "German Various." (E) Comments to 3-E, above, apply here.

(J) The criterion for regarding athletes as "not renowned" is weak. Athletes from this source were separated for lack of reliable criteria (see comment to 2-J, above).

TABLE 1
Description of the athlete populations (I).
Components of the total ordered chronologically by date of collections

A	B	C	D	E	F	G	H	I	J
No.	Name of the Sample	Responsible for the Collection	Time of Data Collection	Year(s) of Publication U = Unpublished	Publication source or archive	N	National-ities of Athletes	Sport. Categ.	Eminence Criteria
1	"First French"	GAUQ	1951–1955	1955, 1970*	IA, AI*	567 (568)*	F	V (28)	N*
2	"First European"	GAUQ	1955–1960 (70)*	(1969), 1970*	(HA), A1*	1189 (915)*	I, G, B, N	V (9)	S, Do*
3	"Italian football"	GAUQ	1956	U*	GL	600	I	F (1)	Do*
4	"German various"	GAUQ	1955–1960	U*	GL	117	G	V (5)	S*
5	"French occasionals"	GAUQ	1955–1975	U*	GL	204	F	V (24)	J*
6	"Para champions"	Para Committee	1962	1970	AI (PC)*	332 (535)*	F, B	V (24)	Do*
7	"Para lowers"	Para Committee	1962	U*	LG	76 (241)*	B	F (1)	Do*
8	"CSICOP-U.S."	CSICOP	1978/79	1979/80, 1982	SI, D10	192 (409)*	U	V (18)	S, J*
9	"Second European"	GAUQ	1978/79	1979	D6	450 (435)*	F, I, B, G, N, S	V (19)	Do, S, J?*
							Sc, L	C (1)	S*
10	"Italian cyclists"	GAUQ	1968/69	U*	GL	24	U	V (23)	, J?*
11	"Lower French"	GAUQ	1978/70	U*	GL	455 (432)*	F	V (21)	S*
12	"GAUQ-U.S."	GAUQ	1981/82	1982	D10	158 (351)*	U	V (16)	J?*
13	"Plus-specials"	GAUQ	1982–1986	U*	GL	27	F		
				Total published		2888			
				Total unpubl.		1503			
				Sum Total		4391			

Note: Column C: GAUQ = M. Gauquelin, partly with assistance by F. Gauquelin.

Column F: IA = L'influence des astres (1955). HA = Les hommes et les astres (1960). A1 = Birth and planetary data, Series A, Vol. 1 (1970). D6 = Scientific Documents, Vol. 6 (1979). D10 = Scientific Documents, Vol. 10 (1982). SI = The Skeptical Inquirer, Winter 1979180, pp. 60–63. GL = Gauquelin Laboratory at Paris (LRRCP). PC = Para Committee at Brussels (for details see References).

Column H: B = Belgian. F = French. G = German. I = Italian. L = Luxemburgian. N = Dutch. Sc = Scottish. S = Spanish. U = U.S.-American.

Column I: F = Football (Soccer). C = Cyclists. V = Various (numbers indicated).

Column J: N = No breakdown by eminence. S = Sources are considered as listing predominantly less renowned or renowned athletes. Do = Athletes drawn from a source are dichotomized using objective criteria, such as whether a football player had or had not been selected for a national team. J = Personal judgement, no sufficientindication of objective criteria which would allow for a replication.

Asterisks refer to "Comments on Entries of Table I."

5: "French Occasionals." (E) The data were not included for publication in Gauquelin's 1970 (A1) sample of athletes. The author copied them manually at Gauquelin's laboratory, from the latter's original index cards.

(J) These athletes, Gauquelin said, had been taken from heterogeneous sources (newspapers, lists of teams, etc.) and were judged as "low-low-ranking" by him.

6: "Para Champions." (F, G) The number of renowned athletes selected by the Para Committee was 535. Since Gauquelin had already 203 athletes from the Para sample in his earlier studies (1955,1960)' only 332 are gained towards the present totals.

(J) Comité Para selected athletes, using objective criteria of success (see also 7-J, below).

7: "Para Lowers." (E) These data (Belgian soccer) were neither in the Para Committee's file nor listed or published by Gauquelin. The index cards were deposited in Gauquelin's archive; the author transcribed the information manually.

(G, J) N = 241 soccer players had not been included in the "Para champions" sample because they had participated in fewer than 20 international events. The athletes had been ranked in the archive by participation at international championships. It was for only 76 out of those 241 discarded players (rank Nos. 1–76), that Mars sector information was indexed; for the remainder (N = 165) no planetary data were tabulated.

8: "CSICOP-U.S." (G) The number of U.S. athletes in this study was 409. K-Z-A published Mars data using a 12-sector scale. Since the present study required 36-sector scaling, only those K-Z-A athletes were suitable from this source whose data had later been published by Gauquelin (N = 192) using the 36-sector division. For the rest of the K-Z-A-sample (N = 217) more precise Mars sector data were not obtainable.

(J) Considering the "bickering" over selection of U.S. athletes referred to earlier, the criteria of selection remain doubtful. They may have changed between categories S (all champions of a source are considered) and J (subjective judgements led to inclusions or deletions).

9: "Second European." (G) Gauquelin analyzed the data of 435 champions. In an appendix to D6 he listed 15 additional athletes whose birth dates had been received too late for inclusion. They were added to the present pool.

(J) Much effort is devoted in this study to describing the sources and criteria used for selection (see appendix, pp. 25–28, of D6 [1979]). The main source was ***Dictionnaire des Sports,*** from which 82% of the athletes of the final sample were drawn. Gauquelin regarded all non-French European athletes listed in the ***Dictionnaire*** as renowned and included them in the sample unless they had already been used in previous investigations (HA 1960, Para Committee). In order to increase the sample of non-French athletes, Gauquelin consulted 12 additional sources. The numbers extracted

there are not given individually; the criteria of selection, however, are briefly described in most cases. Since the main source *(Dictionnaire)* contains a majority of French athletes, with a greater likelihood of the less renowned to be included, Gauquelin discarded many of these, referring to objective criteria where he could. For individual sports he retained only French winners of Olympic medals or of World and European Championships. In respect to French team sports, he kept soccer players who had played at least once on the national team. More than 10 participations with French national teams was set as a requirement for other team sports (basketball, handball, rugby).

10: "Italian Cyclists." (E) The *data* were copied manually at Gauquelin's laboratory.

(J) Cyclists listed only in the Italian *Velo 1968 and 1970* journal but in no other sources, were not included in DG (1979), as Gauquelin considered them low ranking.

11: "Lower French." (E) The *data* were copied manually at Gauquelin's laboratory.

(G) The original number of French athletes who were discarded was 432. However, the data of 23 additional athletes of lesser rank had been collected by 1986, raising the sample N of this category to 455.

12: "Gauq-U.S." (G) Gauquelin's U.S. Sample consisted of 351 athletes. As a subsample of 192 had already been used in the K-Z-A-study (see sample no. 8), 159 newcomers were added to the present pool.

(J) Gauquelin made an effort to secure outstanding individuals. Ten sources were used with *Who's Who* directories not regarded as appropriate. After having decided that a given source was to be used, Gauquelin said, no entries were discarded. The reasons for the low final number of athletes are described in detail. They appear to be circumstantial and not related to eminence.

13: "Plus Specials." (E) Gauquelin mailed these sets to the author after his return from Paris. Inadvertently they had not been handed over. There are sports figures from former French colonies and from Paris arrondissements where birth records were difficult to obtain. Gauquelin indicated he tried hard to obtain the data since the athletes in question were famous, and he was successful in 27 cases.

(J) The basis for selection according to Gauquelin: "From criteria of *Dictionnaire des Sports* I consider them as high ranking" (personal communication, May 10, 1986).

Overall Assessment of Data Base

Four evaluative statements will summarize the issues:

1. The total sample of athletes (N = 4391) is large enough for breakdowns by degree of eminence.

2. The number of unpublished athletes data is considerable (N = 1503). Six unpublished samples are Gauquelin's own (nos. 3, 4, 5, 10, 11, 13), one is the Para Committee's (no. 6). As a rule, it was the data of less eminent athletes that had been excluded. The Gauquelins have reported totals of four unpublished samples (nos. 3, 4, 10, 11) giving rationales for the exclusions. On the other hand, two other unpublished samples (nos. 5, 13) were not known to exist until now. Moreover, in the case of two published samples—nos. 2 and 9—the totals have grown since publication. Finally, Gauquelin has reported no results at all for unpublished samples nos. 5, 7, and 13. A skeptic might suspect that all of the above leaves some room for manipulation. The likelihood of coming upon respective evidence has increased.
3. Eminence criteria used by Gauquelin for distinguishing top athletes from lower ranking ones are not consistent. He did apply objective criteria, but these changed over time. There are also instances of nonrepeatable ratings. Informing the reader about criteria of selection does not rule out the possibility of bias. Moreover, discarding individuals entirely without stating a principle of selection—as occurred in no. 4—seems dubious practice.
4. Gauquelin did not hesitate to make available his unpublished data, including those of whose existence the author was not aware. The data was copied from his files, printouts were returned to him for verification of accurate transcription. Gauquelin thus supported the author's attempt of gathering all existing records irrespective of their previous use. Three days and nights were spent in the Paris laboratory, with Gauquelin absent about half of the time. All his files were fully accessible. Additional athlete records were looked for in Gauquelin's absence—with his permission—as he himself might not have recalled the location of all at the moment (none were found). The author believes he would have detected traces of manipulation if Gauquelin had in fact made special attempts to "make" Mars related to the athletes' births.

Citation Technique

Citation frequency is an objective criterion for renown or eminence. In scientific publications, important references tend to be cited more frequently than minor ones. Thus, the Science Citation Index has been used to determine the eminence of scientists or scientific institutions (Elkana, 1978).

In the present study, citation counts are to define the eminence of sports figures. In the process, some difficulties arise, however. Imagine first, ideal conditions: A large number of independent biographical sources are at one's disposal. Every source covers every field of sports, every nation having participated in international championships is represented. Sports categories, nations, and time periods are considered in balanced proportions.

More successful athletes have a greater chance to be included than those of lower ranks.

In a separate study when writers and painters were graded for eminence, the author encountered conditions almost ideal for determining eminence by citations (Ertel, 1987). Sources for athletes were not as satisfactory for this purpose (see Table 2, below, along with the comments there). The main difficulty was that the number of sources with more general scope was small. For individual sports categories, therefore, additional sources had to be screened in order to raise the overall level of citation frequencies. In the Gauquelin data pool, however, sports categories are unevenly represented (see Table 3). Citations for athletes in different fields may thus be affected by the mere number of individuals who happened to be included in Gauquelin's population. It would have been desirable to counterbalance these differences by using differential numbers of more or fewer screening sources

TABLE 2
Description of the screening sources: Screening sources used to obtain indices of citation frequencies

No.	Author	Title	Year of Publicaton	Sporting Category	Informat. Displ.	N Hits Publ. Sample	N Hits Unpubl. Sample	N Unique Hits
	A	B	C	D	E	F	G	H
1	Le Roy, B.	Dictionnaire des Sports	1973	various	A, I	1029	488	668
2	Garcia J. P. a al.	La fabuleuse histoire (4 Vol.)	1973/78	various	A	556	33	51
3	Kamper, E.	Lexikon der 12000 Olympioniken	1974	various	A	305	48	60
4	La.	Stars des Sports	1970	various	A	229	29	12
5	Faßbender, H.	Sporttagebuch des 20. Jahrhunderts	1984	various	I	181	4	9
6	Soderberg, P. et al.	The Book of Halls of Fame	1977	various	I	140	3	34
7	n.a.	Sporthöhepunkte	1980/83	various	I	134	7	6
8	Umlauf, L.	World Almanac Book	1980	various	I	90	0	32
9	Newman, G.	The concise encyclopedia	1979	various	I	65	0	3
10	Gronen, W. & Lemke, W.	Geschichte des Radsports	1984	cyclists	I	80	3	25
11	n.a.	Dictionnaire du cyclisme		cyclists	A	•	67	16
12	La.	World cup 1974	1974	football	T	122	15	53
13	Chambe, R.	Histoire de l'aviation	1980	airplane	I	88	3	91
14	Gordon, R. & Goldman	The Ring	1981	boxing	T	28	0	9
15	Watman, M.	Encyclopaedia of track & field	1981	track & f.	I	144	20	18
16	Cimarosti, A.	Auto-Rennsport	1973	tennis	T	25	6	11
17	n.a.	Tennis-Jahrbuch	1984	tennis	T	27	1	1
18	n.a.	Skiweltmeisterschaften St Moritz	1974	ski	T	16	5	1

Note. Column A: n.a. = No author's name given.
Column E: A = Alphabetical directory, biographical articles. I = Alphabetical name index. used for the present purpose. T = Table(s) of sports events. Chronological listings and/or sporting records (converted into alphabetical order for the present purpose).
Column F: • = Missing data: The list of published athletes was not available at the time the unpublished athletes were screened.

TABLE 3
Description of the athletes' sample (I).
Ranked frequencies of athletes in sporting categories

No.	Sporting Category	Published Samples	Unpublished Samples	Total	%
1	Football (Soccer)	685	788	1473	33.5
2	Cycling	534	136	670	15.3
3	Rugby	267	147	414	9.4
4	Track and field	231	183	414	9.4
5	Aviation sports	391	6	397	9.0
6	Boxing	248	7	255	5.8
7	Auto-motor sports	49	58	107	2.4
8	Basketball, P.d.B.	90	8	98	2.2
9	Tennis	76	15	91	2.0
10	Swimming	42	20	62	1.4
11	Skiing	42	2	44	1.0
12	Fencing	18	20	38	0.9
13	Golfing	27	4	31	0.7
14	Baseball	25	1	26	0.6
15	Weight lifting	21	3	24	0.6
16	Equestrian sports	14	9	23	0.5
17	Gymnastics	13	10	23	0.5
18	Rowing	8	15	23	0.5
19	Hockey	14	6	20	0.5
20	Wrestling	13	7	20	0.5
	10 add. categories (each < 20)	80	58	138	3.1
	Total	2888	1503	4391	100.0

Note: From KZA-athletes (N = 409) only a subsample of N = 192 could be used whose sporting categories were taken from M. Gauquelin's 1982 publication.

for different sports. In addition, frequencies of citations for athletes of different categories should have been weighted in order to equalize their contributions. Finally, the uneven national contributions (see Table 4) should have been taken into account. Understandably, these desiderata could not all be realized in practice.

The following particulars of Table 2 might seem overly detailed for less skeptical readers. Some aspects of the Mars effect debate, however, make it advisable to forestall the ambiguities which brevity would bring about.

General Comments on Table 2

Screening sources nos. 1–9 each cover numerous sports categories. Sources nos. 10–18 deal with only one each. Sources nos. 1–9 are arranged here, in descending order, with respect to the number of Gauquelin athletes in those entries. Sources nos. 10–18 are similarly arranged with respect to the proportions of sports categories within Gauquelin's athletes' sample. The numbers of sources chosen for individual sports classifications depend

TABLE 4
Description of the athletes' sample (II).
Nationalities for the published, unpublished, and total samples

No.	Nationalities	Published Athletes	Unpublished Athletes	Total	%
1	FRA	1357	683	2040	46.5
2	ITA	703	625	1328	30.2
3	BEL	323	76	399	9.1
4	USA	351	0	351	7.9
5	GER	37	117	154	3.5
6	NET	60	2	62	1.4
7	SCO	43	0	43	1.0
8	SPA	10	0	10	0.2
9	LUX	4	0	4	0.1
Σ		2888	1503	4391	100.0

on the importance of the respective categories within Gauquelin's athletes pool.

Gauquelin athletes can be identified, without error, in the sources containing biographical articles arranged in alphabetical order (A, see Column E). Mere indexes of names are less dependable for identification: they lack birth information, for one, and the identity of such names in Gauquelin's compilation does not always justify assuming an identity of persons. On the other hand, the person doing the matching may also fail to notice factual identity. Uniqueness of a name—the most salient criterion for the identity of an individual with entries in different places—may be misleading. There may be trivial differences in the first names (e.g., Bill rather than William); two initials instead of one; different spelling or certain classes of surnames; double and/or hyphenated surnames during a woman's career, and so forth. The records were consulted where doubts arose, but these were not resolved in every instance.

The citation "hit" figures are given separately for published (N = 2888) and unpublished athletes (N = 1503) (see columns F and G). Gauquelin tended not to publish data associated with athletes of lower achievements. Fewer "hits" in column G, relative to column F, was the result throughout.

"Unique hits" (column H) are recorded in the particular source and not replicated in others. For example, excessively few unique hits occur with source no. 9—this is understandable, since concise encyclopedias of athletes generally reference only the most significant figures; yet those would likely appear in other sources as well. An extremely large number of unique hits was found with source no. 13, that is, airplane sports champions. Even outstanding performers in this category are not generally regarded as members of the general sporting scene. In contrast to ground-, water-, and snow-, or ice-based sports, airspace activities are not typically regarded as an arena of competition.

Comments on Individual Sources (Table 2)

(For full biographical references see Appendix 2.)

1. The ***Dictionnaire des Sports*** was Gauquelin's main source for obtaining athletes' names, birth dates and birth places. The number of hits are large, not only for published samples, but also for unpublished ones. This observation will be dealt with below. (The book was on loan from M. Gauquelin.)
2. "Editions **O.D.I.L."** published four volumes of ***Fabuleuses Histoires*** (for rugby, soccer, cyclists, and track and field). An appendix to each offers a collection of biographical articles in alphabetical order, devoted to the most eminent athletes of the respective fields. ("Gotha Français" and "Gotha international"). (The books were located in Gauquelin's laboratory and were perused there.)
3. Kamper's ***Olympioniken*** book lists gold, silver, and bronze medal awardees for all Olympic Sports. The book went through several updated editions, and English and French translations exist. An addendum to Kamper's book with the winners of the 1976 Olympics was also used.
4. ***Die Stars des Sports*** is an ideal screening source. Nearly 6,000 outstanding athletes are listed alphabetically whether they excelled at Olympics or other international championships. A national bias, if at all present, is probably much less pronounced than with the ***Dictionnaire des Sports.*** (The book is out of print; a xerox copy was available.)
5. The scope of Fassbender's ***Sporttagebuch*** is a broad one (its chapters deal with 13 sports categories). An obvious intent here was to cover all outstanding achievements and to give balanced historical accounts (At the public library, Gottingen.)
6. "Halls of Fame" athletes are the Best of the Year as elected by local or regional institutions in the U.S.A. and Canada. In each sports field (even angling, billiards, softball, dog racing) the most famous or popular persons are chosen. In rare cases, a foreign champion may also be elected (as was the German boxer Max Schmeling). Since each local group (e.g., "North Dakota Golf Halls of Fame," "Arizona Horse Racing Halls of Fame") has its own "Halls of Fame" selection, the average achievement level of the total pool is comparatively low. (At the Sporthochschule, Koln.)
7. The ***Sporthöhepunkte*** provides lists of winners of international championships for eight sports fields, in chronological order. (At the Gottingen public library.)
8. The ***World Almanac*** provides biographical articles on "sports personalities," pp. 209–224. Some of the most outstanding sports figures have been selected. The range is broad in scope with respect to nationality, sports category, and historical period. (The book was borrowed from Gauquelin.)

9. "Newman's concise encyclopedia" is comparable in quality to the *World Almanac.* (At the Sporthochschule, Koln.).
10. *Gronen* offers a narrative chronology of bicycle races (1899–1939); its scope is international. Cyclists listed in the name index were generally considered more outstanding than those not cited. (At the Sportseminar of Gottingen University.)
11. The *Dictionnaire du Cyclisme* is a biographical dictionary on cyclists only. Biographical information was neglected. A large number of names are provided by the index. (The author had located this reference during his final visit to the Koln Sporthochschule. As he planned to screen unpublished athletes in data sets brought from Paris, the list of published cyclists was not needed for that purpose, therefore not at hand. Consequently, there are missing data in column F.)
12. The appendix of *World Cup* identifies all soccer players who took part in the Final Rounds of World Cups 1939–1974. Every one of them was included. (At the public library, Gottingen.)
13. Chambe's *History of Aviation* includes an index with the names of all individuals who made outstanding contributions to the field in terms of records and achievements. (At the Sporthochschule, Koln.)
14. The index of *The Ring,* a voluminous encyclopedia, lists names of all boxers referenced in individual articles of the book. The most successful champions are identified by bold face type, and only these were considered here. A national bias (U.S.) is apparent. It was not possible to locate a comparable source for sufficiently large numbers of European fighters. (At the Sporthochschule, Koln.)
15. Watman's *Encyclopaedia on Track & Field Athletics* contains biographical articles in alphabetical order. For the most part a name index was used. Its coverage is broad and balanced, although with some national bias. (At the Sporthochschule, Koln.)
16. The appendix to *Cimarosti* lists Grand-Prix winners since 1906 in chronological order. All were considered. (At the public library, Göttingen.)
17. From *Tennis Jahrbuch* the names of Wimbledon champions (single, double, both sexes; 1877–1983). (At the Sportseminar of Gottingen University.)
18. *Skiweltmeisterschaften St. Moritz* details the records set in World Alpine Championships (1931–1971). For each year the names of the first ranking skiers were used. For the period 1966/67 to 1972/73, the first 50 ranks of total Alpine achievements are tabulated, and names were likewise included. (At the public library, Gottingen.)

General Evaluation of the Citation Measure

The screening sources used in this study do not, in their entirety, meet the ideal requirements stated earlier. The citation index to be derived will be less

reliable than it should be. Its reliability might be improved by utilizing additional sources. More such sources do exist. However, some were unavailable (e.g., the Lincoln Library of Sports Champions). Some accounts, though available, are in languages outside the author's expertise (Russian, Hungarian). In any case, greater investment along those lines would not necessarily pay off. It was decided to discontinue further searches after 18 sources had been assembled. (Four volumes of O.D.I.L. editions are counted as one, but are listed individually in Appendix 2, hence there are 21 entries there instead of 18.)

Regarding procedure, the following applies: (a) No source was rejected once it had been decided upon, and only those athletic books on sports were discarded at the outset which failed to meet minimal criteria. (b) Athletes' names were recorded without omissions. (c) Data were compiled without knowledge of the individual's planetary sectors. (d) Screenings carried out by one person were generally checked by another, except for two directories not accessible in the Gottingen area. (e) Anyone interested can readily check the identification of Gauquelin athletes in the source materials, by requesting printouts with hits noted, from the author. In addition all 14 sources or copies of indexes from nos. 3 to 18, excluding 8 and 11, are available on a loan basis.

In sum: The present procedures are regarded as sufficiently objective. No selection bias can have influenced the number of hits defining eminence. A measure being less than optimally reliable cannot lead to an error that would in turn favor the Mars phenomenon. Rather, it would blur the effect —assuming it does exist. Only if analysis suggests an acceptance of the null-hypothesis (i.e., no Mars effect) would the reliability of the procedure still have to be improved as a safeguard against wrong conclusions.

Analysis and Results

Key Sector Definition

In previous research on planet-birth relations, two definitions for the "key sector" have generally been in use, namely, a 12-sector or a 36-sector definition. Key sector zones of the 12-sector breakdown cover only three fourths of the key sector zones defined by the 36-sector division: that is, key sector I, defined on a 12-sector basis, does not include sector 36, key sector zone 2 does not include sector 9 of the 36-sector division (see Figure 1).

The 12-sector scale was in use throughout the Mars effect debate. In the present study, however, the 36-sector division is preferred. The decision is justified empirically: Frequencies of births for Mars sectors, using the 36-sector scale, were calculated for the total of athletes (N = 4391). As seen in Figure 2, birth frequency in sector 36 (first column, left) is closer to the mean frequency of subsequent key sectors 1–3 than to the mean of the preceding nonkey sectors 33–35 (the last three columns, on the right). Simi-

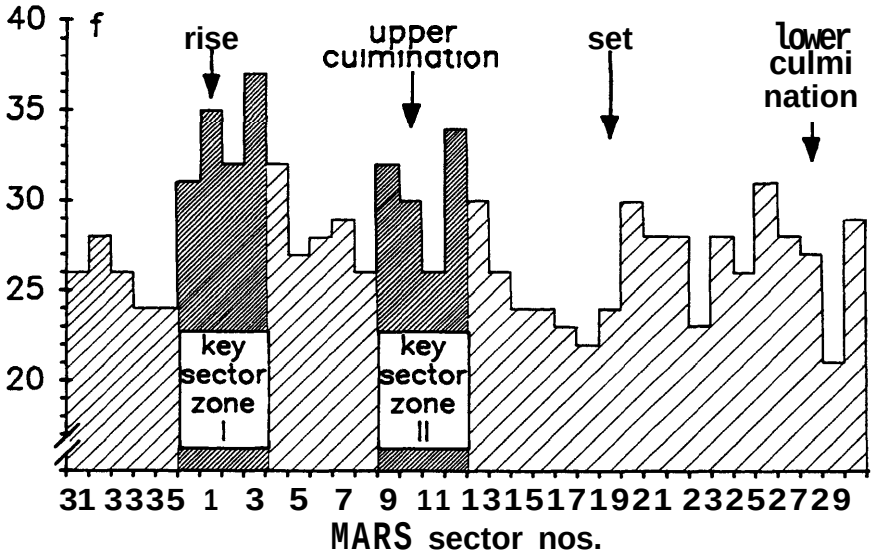

Fig. 2. Birth frequencies of athletes (total sample N = 4391) as Mars is crossing sectors 1 through 36. (For key sectors I and II definition see Figure 1.)

larly, birth frequency in sector 9 is closer to the mean frequency of subsequent sectors 10–12 than to the mean frequency of the preceding nonkey sectors 6–8. The advantage of using a 36-sector division has been demonstrated more extensively elsewhere (Ertel, in press-a). The present sector definition by itself does not favor, in some nonlegitimate way, the eminence hypothesis examined below.

Defining Eminence Ranks

Although 18 screening sources were used in this study, the maximum number of citations achievable by an athlete is only 9, since 9/18 sources contained information for just one sports category each. The empirical range of citation frequencies ($c = 0 \cdots 8$) and their distribution for the total is shown in Table 5. The comparisons suggest that Gauquelin's decision to exclude certain samples of athletes in his publications must have been based, indeed, on their low level of eminence.

Rather as expected, as citations become more frequent ($c = 0, 1 \cdots 8$), their occurrence N_c becomes correspondingly less frequent (N_c = 2271, 1100 · · ·, 3). To avoid low reliability of rare events, subsamples of frequent citations were suitably combined. Table 5 shows that pooling the counts $N_c = 4 \cdots 8$ results in N = 232. Athletes achieving ($c \geq 4$) are assigned the top rank of 5; rank 4, preceding, accounts for 253 cases; and so forth.

In one of the analyses to be presented, subsamples are drawn from the total group of athletes. In these cases ranks 4 and 5 have been combined in order to maintain an acceptable level of reliability (Confidencelimits of $_k$S%

TABLE 5
Description of the athletes' sample (III). Citation frequencies (N_c) for published, unpublished, and total samples and frequencies of ranks (N_r) for total sample

	Frequencies of citations (N_c)				
	Samples:				Frequencies
c	Published	Unpublished	Total	Ranks	of ranks (N_r)
0	1331	940	2271	1	2271
1	657	443	1100	2	1100
2	462	73	535	3	535
3	210	43	253	4	253
4	96	4	100		
5	78	0	78		
6	33	0	33	5	232
7	18	0	18		
8	3	0	3		
Σ	2888	1503	4391		4391

Note: N_c-values are converted into ranks 1 through 5.

values for samples with $N < 250$ are generally too broad. Gauquelin himself objected to Zelen's parsimony in sampling for this very reason.)

The validity of citations as a measure of eminence may be judged to an extent *post hoc* by glancing over the names of 50 top athletes listed by descending rank of citation (see Appendix 2). Readers somewhat acquainted with the history of records in sports should find among the top 50 a large majority of figures well known for successful international competition. More accurate assessment requires expertise, however.

Another test of the validity is to determine, for each level of citation frequency (c), the proportion of Olympic winners of medals (Kamper's ***Who is Who in the Olympics,*** which is used for identification here, had to be excluded). The percentages of such Olympians at levels of $c \geq 6$, 5, 4, 3, 2, 1, and 0, are as follows: 57.1, 44.8, 46.5, 20.8, 13.8, 7.6, and 2.6, respectively. The corresponding totals are: 23, 58, 99, 228, 521, 1126, and 2331, respectively. It can be seen that, for example, 57.1% of those athletes (absolute count, 23) with six or more citations also distinguished themselves at the Olympics. Likewise, 44.8% of those with at least five citations (absolute number, 58) had demonstrated Olympic excellence. The proportion of Olympic champions in subsamples of still lower citation rates dwindle rapidly. It is a mere 2.6% of Olympic athletes who failed to achieve a single citation as defined, in addition to their being listed in Kamper's Who is ***Who.***

Testing the Main Hypothesis

Table 6 shows the main result. Out of 2271 athletes classified as lowest in eminence, $f_{ks} = 555$ were born during Mars key sector passages (i.e., their

TABLE 6
Results: Frequencies of Mars key sector cases (f_{ks}), key sector percentages ($_kS\%$), and deviations from expectancy (kS%-E%), by athletes' ranks

Ranks	N	f_{ks}	Confidence Limits 95%	$_kS\%$	Confidence limits 95%	$_kS\%$-E% E% = 22.2
1	2271	555	±40	24.4	±1.76	2.22
2	1100	275	±28	25.0	±2.56	2.78
3	535	146	±20	27.3	±3.77	5.07
4	253	76	±14	30.0	±5.65	7.82
5	232	75	±14	32.3	±6.01	10.11
Σ	4391	1127		$\bar{X}$ = 25.7		

$_kS\%$ = 24.4). This figure exceeds chance expectation by 2.2296, ($_kS\%$ = 100 * 36/8 = 22.2%; an approximation corresponding to the 16.67% approximation used previously for 12-sector scale calculations). Key sector percentages increase, monotonically, with rank of eminence. Deviation from chance level is in fact greatest for the top ranking individuals (i.e., 10.11%, see also Figure 3).

A powerful test for monotonic trend with ranked qualitative data is based on Kendall's tau coefficient (see Marascuilo & McSweeny, 1977). Kendall's tau = .037, z = 2.669, p < .005. Level of eminence, ranked 1 through 5, is plotted on X; the key sector status appears on Y.

Finally, a test for monotonic trend of ranked proportions was performed, based upon a Chi square rationale, as suggested by Fleiss (1981, pp. 147–149) who refers to its first description by R. E. Barlow. The Chi^2 statistic for the data is 10.42, m = 5 proportions, and located within the $p < .005$ range with lower boundary $\chi^2 = 9.784$. (The value of χ^2 may not be referred to tables of χ^2, see Fleiss, p. 148.)

There are k*(k-1) = 15 differences among proportions for k = 5 ranks. These were also tested individually using Cohen's arcsine transformation and effect size index h. Significant effect sizes were noted between ranks 1 and 4 (h = .126, $p < .05$); between 1 and 5 (h = .176; p < .01); between 2 and 4 (h = .11, p < .05), and 2 and 5 (h = .16; p < .05); respectively. The associated power values of the normal curve test (1-β) are calculated as .41, .41, .41, .38, respectively (see Cohen, 1977, p. 179ff).

Comparing Unpublished with Published Data

At this point the question of possible bias in data compilation should be reexamined. If Gauquelin had excluded those athletes whose birth hours did not match the kS passages of Mars so as to obtain an eminence trend for kS%, the latter could hardly have emerged in the present instance. The reason is that all athletes whose data had originally been excluded from publication and/or anlaysis have now, too, become part of the study population.

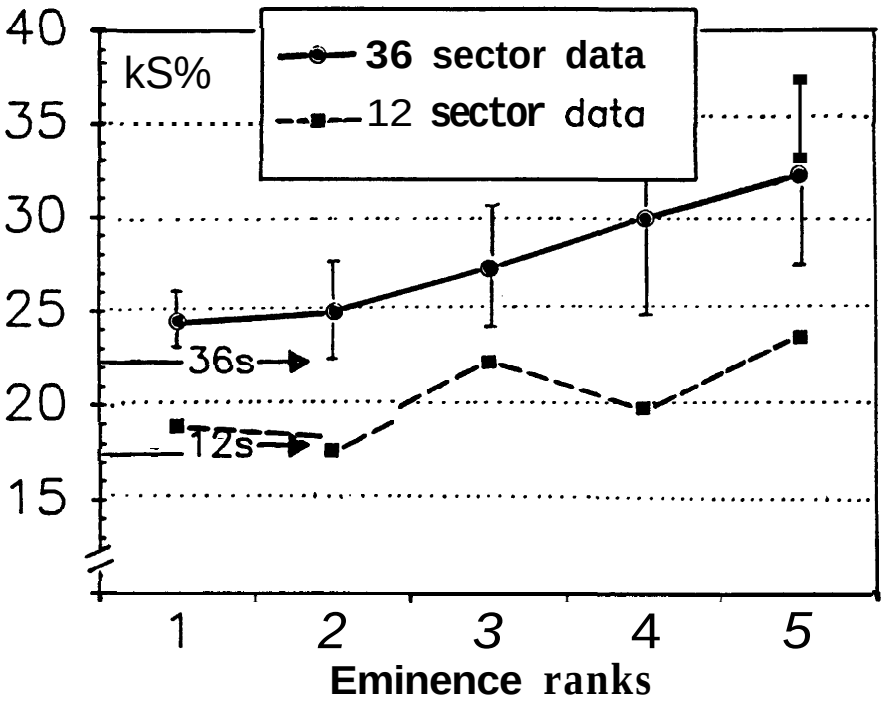

Fig. 3. Main result: key sector percentages increase with eminence. ***Solid line:*** Mars key sector percentages **(kS%),** with **kS-definition** derived from the 36-sector scale for athletes of five eminence ranks (5 = highest rank) based on citation frequencies (N = 4391) (for details see Table 6). The vertical **bars** show the possible variation for p = **.95.** (The ranges of confidence increase with eminence ranks, which is due to decreasing number of individuals **[see** Table 6].)

Dashed line: Mars key sector percentages (kS%) using **kS-definition** derived from 12-sector scale.

Nevertheless, the question deserves more **detailed** consideration. Selection bias is more likely to enter if decisions to discard or not to discard individuals are made by someone who is aware of their **Mars** sectors at birth. Suppose Gauquelin had excluded athletes without knowing their planetary positions, the resulting aggregates of published samples should not differ from unpublished ones with respect to **kS%,** but only with respect to total frequencies. That is, athletes achieving few citations should merely be more numerous, those with more citations should be less in number in the unpublished samples as compared with published ones.

A difference of absolute numbers has in fact been noted earlier **(see** comments, Table 5). However, in comparing kS% for published and **nonpublished** samples, we find, in addition, a substantially lower **kS%** level among the latter (see Figure 4). The respective differences of **kS%** for ranks 3 and 4 may be disregarded since among unpublished athletes there are very few with higher ranks. The **kS%** figures for less eminent athletes, ranks 1 and 2,

on the other hand, involve numerous unpublished records. Here we find strong statistical support for a difference in kS% between published and unpublished samples: χ^2 exceeds chance levels at $p = .006$ for rank 1, $p < .005$ for rank 2. The discrepancy does seem to indicate that Gauquelin's knowledge of kS condition at the time he made the decision to segregate high from low achievers had an influence on his sample.

This conclusion, however, is not as certain as it might seem. The difference in question could stem, in part or even entirely, from an advantage of Gauquelin's carefully judging the subjects' achievements as described in their biographies. Directory citation is only more objective in assessing eminence; at the same time it is less sensitive. Gauquelin's taking into account detailed biographical information might have been more appropriate for excluding athletes of lower standard from the study sample. Assuming that the Mars effect exists, it would follow that among a sample of athletes with equal citation count individuals discarded due to relatively poor items in their sports career would yield a lower average kS% compared to those who, after using the same criteria, were selected for analysis and

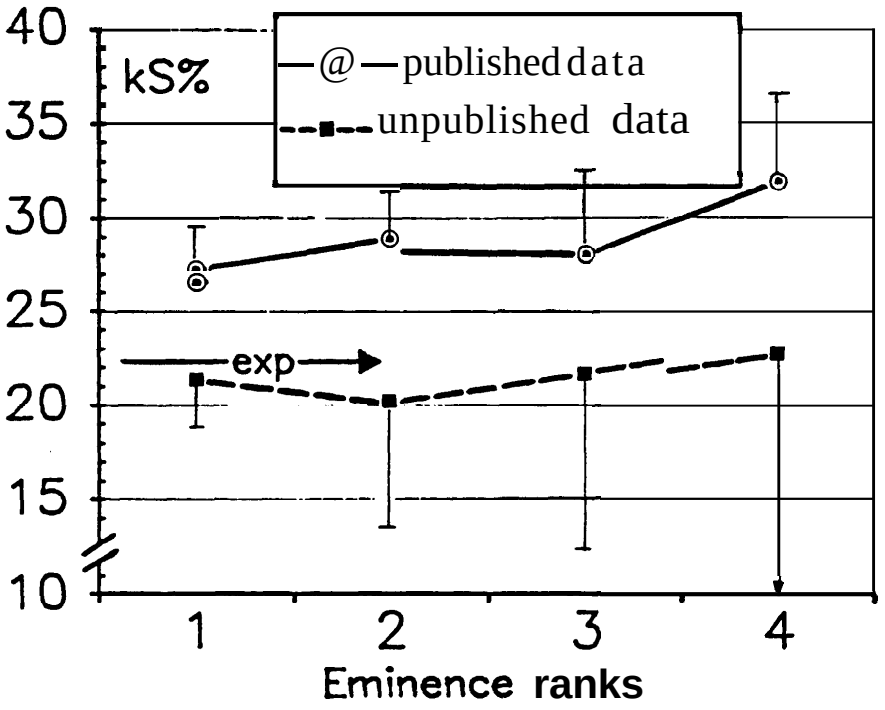

Fig. 4. Notable, but ambiguous differences between key sector percentages of published and unpublished samples. ***Solid line:*** **Mars key sector percentages (kS%) for athletes from published Gauquelin samples (N = 2888).**

Dashed line: **Percentages (kS%) for those athletes from unpublished Gauquelin samples (N = 1503).**

eventual publication. The conclusion then is that either Gauquelin's sensitiveness concerning biographical content, or his sensitiveness concerning the candidates' Mars sector at birth—or both-could account for the difference between the lines in Figure 4.

Another test was performed to clarify this ambiguity. A subsample of N = 659 was drawn from the total of unpublished entries (N = 1503). These were athletes chosen by Gauquelin under circumstances presumably more liable to bias than others (samples 5 and 11, see Table 1). Frequencies of Mars key sector passages at birth were then determined using the 36-sector scale and converted into percentages. The resulting graph may be compared with the Mars kS% of the published sample (N = 2888) (see Figure 5). The dashed line represents kS% for published data. Notice the upswings following the rise and culmination of Mars: the kS-effect.

What distribution should be expected for those data which Gauquelin had exempted from analysis and/or publication on the grounds that their biographies reported less success? The kS-peaks should be less prominent, the pattern may be washed out; that is, the Mars effect should tend to vanish. Surprisingly, however, the solid curve in Figure 5 still evidences marked deviations around both kS-zones. Even more surprisingly, deviations have the opposite direction. (Reversals of kS-frequencies for unpublished data have been emphasized by shading the respective areas.)

No doubt, this is evidence of bias in Gauquelin's selection procedure. For some of the lower ranking athletes, his acquaintance with Mars position

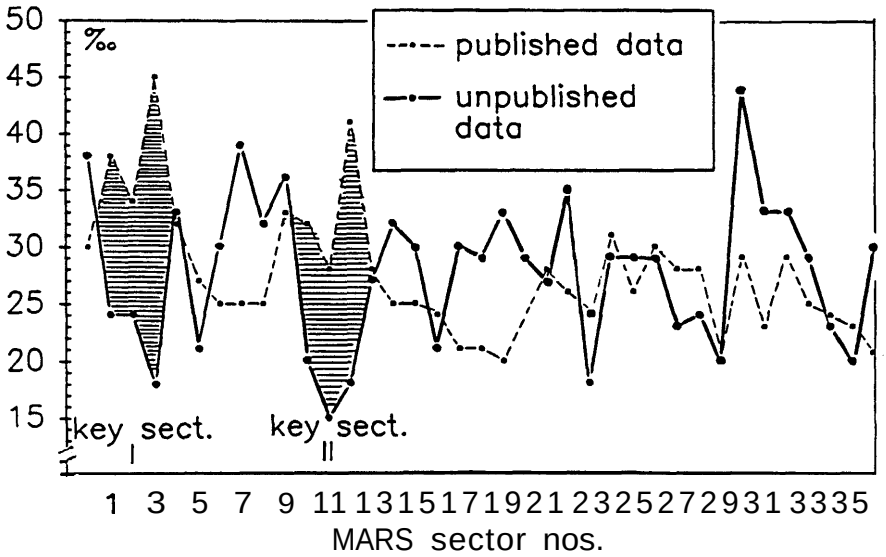

Fig. 5. Gauquelin bias effect: Mars sector frequencies ‰ for published Gauquelin athletes (N = 2888). dashed line; and for a subsample of unpublished athletes (N = 659). solid line. Marked negative deviations are apparent in key sector areas for unpublished data.

must have played a role, that is, athletes with birth times not associated with kS transitions were more likely to be discarded. Striving for objectivity, Gauquelin may yet have overrated his ability to remain unaffected by his knowledge of planetary positions. Concern over the outcome of the analysis seems to have interfered with the best of his intentions[4]

The crucial question remaining is as follows: Could the kind of bias noted in Gauquelin's procedure invalidate the outcome of the present study? Could an artefact carried over from original materials raise the risk for wrong conclusions? An answer is afforded in Figure 6: kS percentages of published plus unpublished data, (solid line, N = 4391), are compared with those of published data only (dashed line, N = 2888). As can be seen, the eminence slope of the former is both lower and steeper than that of the latter. That is, the omission of athletes from experimental samples which occurred here and there on account of Gauquelin's bias had two consequences: (a) It served to inflate the level of kS-proportions overall; but also, (b) it weakened the eminence effect. The recombining of the unpublished with published records served to repair (i.e., to lower) the eminence level.

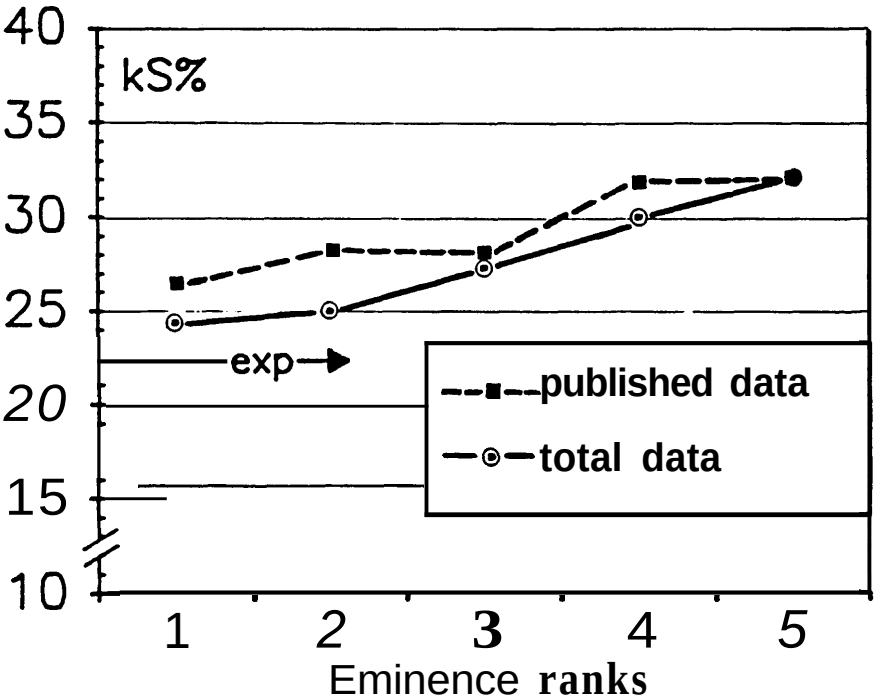

Fig. 6. Gauquelin bias effect: The eminence slope of published data (total minus unpublished) is less steep than that of total data. *Solid line:* Mars key percentages (kS%) for athletes from the total sample (N = 4391) (see also Figure 2). *Dashed line:* Mars key sector percentages (kS%) for athletes from published samples only (N = 2888) (see also Figure 4).

But at the same time it served to repair its slope (i.e., to make it steeper). The presence of selection bias, therefore, does not weaken the conclusion that Mars' position and the athletes' births are statistically related. Paradoxical though it may seem, this claim has been corroborated due to this bias: Correcting for selection bias by pooling all records *increased* empirical support for the stronger version of this claim; the data have overcome, *in spite of disturbing effects* of bias, the higher methodological hurdle.

Concluding Remarks

Passionate skeptics might continue to argue that it is still easier for a crank scientist to wrap some fabulous features around a fraudulent study than it is for Mars to contribute to an athelete's sports career. They might think that believers in relations between planetary positions and human births violating fundamental laws of physics of today, must err. Those who consider themselves as more liberal may continue to suspend judgement. In the investigator's view, however, the results of the present study have shown that Gauquelin's basic claim, first stated in 1955, is apparently valid. It is an interesting fact in its own right that the first acknowledgments from mainstream scientists required two to three decades to emerge (the first such reaction, if not based upon research of his own was Eysenck's in 1975). More effort directed at a better understanding of this provocative anomaly is now deemed to be highly desirable.[1]

Endnotes

[1] An annotated chronology of the main titles representing the Mars effect debate might be helpful for readers interested in the history of the problem (see Appendix 1).

[2] See the research report by M. & F. Gauquelin (1977). It is not inconceivable, however, that Gauquelin included in or excluded from the experimental collection a certain number of athletes in order to obtain a subsample with kS proportion equal to that of the total sample. G. Abell suspected that Gauquelin might have manipulated the sample at this stage of the research. The point of his suspicion, however, was overrated. For methodological reasons, kS proportions of the experimental sample had to be representative of the kS proportion of the total sample. If the experimental sample, drawn through Gauquelin's procedure, had not shown, upon first inspection. a kS proportion commensurate with that of the total, the investigators should have made improvements in their selection technique. Athletes with Mars in key sectors should have been added or deleted, respectively, so as to assure greater representativeness. Randomness of selection was in fact not called for. Even a completely deliberate selection of an experimental sample having a level of kS% equal to that of the total, could not have fostered an experimenter's goal to obtain a higher (or a lower) kS% level for the controls as compared to results yielded by a random selection of experimental athletes.

[3] Eleven post *hoc* selections of either "more successful" or "less successful" U.S. athletes were made. six by Kurtz-Zelen-Abell (two articles). five by the Gauquelins.

[4] Gauquelin did not dispute a bias of this kind in a public conference (see endnote 5). Its existence, however, does not exclude an additional positive effect due to biographical sensitivity. As referred to before. the difference of kS% levels between published and unpublished

samples, as shown in Figure 5, may still be partially due to a superiority of Gauquelin's weighing biographical information over crude citation counts. Athletes with equally low citation scores may nevertheless differ in achievement. The relative contributions to the difference seen in Figure 5 of a "bias effect," on the one hand, and that of a rating advantage, on the other, remain a matter of debate; but, in view of the present stage of insight into the data structure, that question has lost most of its importance.

[5] The study was supported by a sabbatical grant From the Deutsche Forschungsgemeinschaft (DFG). A travel grant from the DFG permitted participation at the "First Eysenck Research Seminar" at Long Beach, California (1986). A paper presented there referred briefly to the results of the present article. Another paper delivered at the Long Beach conference on further replication tests of the Gauquelin claims was published elsewhere (Ertel, 1987).

Before commencing this study, the author sent a research proposal to the Para Committee (Brussels), CSICOP (Buffalo, N.Y.), to CFEPP (Paris), to some participants of the previous Mars effect debate, as well as to consultants. Some months later a Newsletter apprised the above of the progress of the study. The author received valuable comments and critiques From a number of respondents.

The technicalities of this study have been attended by several dedicated assistants. This includes archival (screening) work: Claudia Brand, Karin Dehne, Eva Nahme, Ruth Preibusch, Peter Ruhlender; data input: Ruth Preibusch; typing: Karin Dehne; figures and tables: Astrid Windwehe, Ruth Preibusch, and Karin Dehne. Hans-Werner Wendt kindly corrected and smoothed the manuscript linguistically.

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Appendix 1
Chronology of the Mars Effect Debate by Main Titles (Abbreviated Here)

Codes: H = The Humanist, SI = The Skeptical Inquirer

Stage One: Zelen Test

1975	*Jerome:* "Astrology Magic" *(H,* Spt/Oct) (Methodological objections are raised against Gauquelin's claims).
1976	*Gauquelin:* "Influence of planets" (H, Jan/Feb) (Rebutting Jerome's objections).
1976	*Zelen:* "Astrology a challenge" (H, Jan/Feb) (An experimentum crucis is proposed).
1977	*Gauquelin, M. & F.:* "Zelen Test" (H, Nov/Dec) (Zelen's test supports the Gauquelin claim).

1977 *Zelen-Kurtz-Abell:* "Is there a Mars effect?" (H, Nov/Dec) (Comments on M. & F. Gauquelin: Zelen test does not support the Mars effect hypothesis).

Stage Two: KZA's (CSICOP's) Replication with American Athletes

1979180 *Kurtz-Zelen-Abell:* "US test results" (SI, Winter) (Negative results are reported).

1979/80 *Rawlins:* "Report on the US-test" (SI, Winter) (Stresses the negative result of the U.S.-test, but criticizes the adequacy of Zelen's former procedure).

1979180 *Gauquelin, M. & F.:* "Star US-sportmen show the Mars effect" (SI, Winter) (Criticizes K-Z-A's U.S.-test and its interpretation).

1979180 *Kurtz-Zelen-Abell:* "Response" (SI, Winter) (Justify their procedures and try to refute the Gauquelins' objections).

1980 *Gauquelin:* "A response" (SI, Summer) (Response to K-Z-A's defense).

1980 *Kurtz-Zelen-Abell:* "Contradictions" (SI, Summer) (Rejoinder to Gauquelin's response).

1980 *Jerome:* "*Mars* effect" (SI, Fall) (Congratulates K-Z-A for their success in finding no support for the Mars effect).

Third Stage: Conflict and Reevaluation

1981/82 *Rawlins:* "*Remus extremus*" (SI, Winter) (Extreme objections by a former CSICOP council member to the handling of the Gauquelin problem by other CSICOP members. His "sTARBABY" article in *Fate* magazine was intended as a Watergate-like disclosure of objectionable maneuvers).

1981/82 *Abell-Kurtz-Zelen:* "Statement" (SI, Winter) (CSICOP's executive council defends itself).

1981/82 *Abell-Kurtz:* "Response" (SI, Winter) ((Defense of members having been individually accused).

1981/82 *Gauquelin:* "Letter" (SI, Winter) (K-Z-A's "Contradictions" of 1980 are refuted).

1981/82 *Abell-Kurtz:* "Response" (SI, Spring) (The authors maintain their objections).

1983 *Abell-Kurtz-Zelen:* "Reappraisal" (SI, Fall) (Some criticisms are acknowledged, others are not. Result: Mars effect now not proven).

1983 *Gauquelin:* "Comment" (SI, Fall).

1983 *Kurtz-Abell:* "Response" (SI, Fall).

Appendix 2
First 50 Top Athletes Ranked for Citation Frequencies

Data: Sources G:A01, Series A, Vol. 1, G:D10, Series D, Vol. 10,
GAUQ: Nos. in Gauquelin data sources.
KZA: Nos. in Kurtz, Zelen, & Abell's data source (Skeptical Inquirer).
Cit. in: Character codes refer to citation sources, Appendix 3.
MARS: Sector no. (36-sector system) of Mars position at the time of birth.
kS: + refers to key sectors.

No.	Data	GAUQ	KZA	Name	Nation	Categ.	Cit. in	Cit.	Fem.	Born	MARS	kS
1	G:D10	185	50	Button, Richard T.	USA	ICES	BDEFHKSX	8		07/18/1929	9	+
2	G:D10	333	91	Dillard, Harrison	USA	TRAC	DEFKOSTX	8		07/08/1923	3	+
3	G:D10	865		Mathias, Robert Bruce	USA	TRAC	BDEKOSTX	8		11/17/1930	13	
4	G:D06	56		Blankers-Koen, Fanny	NET	TRAC	BDFKOST	7	F	04/26/1918	15	
5	G:D10	226		Charles, Ezzard	USA	BOXI	DEFHRSX	7		07/07/1921	21	
6	G:D06	103		Clark, Jim	SCO	CYCL	BCDEFST	7		03/04/1936	12	+
7	G:D10	238	62	Clay, Cassius	USA	BOXI	BDEFHKS	7		01/17/1942	10	+
8	G:D10	257		Connolly, Maureen	USA	TENN	BDFJSTX	7	F	09/17/1934	14	
9	G:D10	426		Fleming, Peggy Gale	USA	ICES	BDFHKSX	7	F	07/27/1948	7	
10	G:D10	437	118	Fosbury, Dick	USA	TRAC	BDFKOST	7		03/06/1947	11	+
11	G:D10	443	120	Fratier, Joe	USA	BOXI	DEFHKRS	7		01/17/1944	22	
12	G:D10	492		Gonzales, Richard Alonzo	USA	TENN	BDEJSTX	7		05/09/1928	4	
13	G:D10	567		Hayes, Bob (Robert Lee)	USA	TRAC	DFKOSTX	7		12/20/1942	16	
14	G:A01	2018		Killy, Jean Claude	FRA	SKII	BDFHKMS	7		08/30/1943	7	
15	G:D10	706		King, Billie J. (Moffit)	USA	TRAC	BDFJSTX	7		11/22/1943	24	
16	G:D10	1003	275	Patterson, Floyd	USA	BOXI	BDFHKRS	7		01/04/1935	22	
17	G:D10	1004	276	Patton, Melvin	USA	TRAC	DFKOSTX	7		11/16/1924	36	+
18	G:D10	1076		Richards, Robert (Bob)	USA	TRAC	EFKOSTX	7		02/20/1926	27	
19	G:D10	1200		Smith, Tommie	USA	TRAC	DEFKOST	7		06/05/1944	29	
20	G:D10	1211	335	Spitz, Marc Andrew	USA	SWIM	BDEFKSX	7		02/10/1950	31	

21	G:D10	1294		Tyus, Wyomia	USA	TRAC	BDKOSTX	7	F	08/29/1945	12	+
22	G:A01	773		Anquetil, Jacques	FRA	CYCL	DFHKOS	6		01/08/1934	3	+
23	G:A01	98		Ascari, **Alberto**	ITA	AUTO	CDEFHS	6		07/13/1918	2	+
24	G:A01	902		**Bartali,** Gino	ITA	CYCL	DFHKOS	6		07/18/1914	3	+
25	G:A01	909		Binda, Alfredo	ITA	CYCL	DFGHOS	6		08/11/1902	28	
26	G:D10	147	41	**Bragg,** Don	USA	TRAC	DKOSTX	6		05/15/1935	36	+
27	G:D06	91		Camera, **Primo**	ITA	**BOXI**	DEFHRS	6		10/25/1906	16	
28	G:D10	270	71	Courtney, Tom	USA	TRAC	DEKSTX	6		08/17/1933	23	
29	G:D10	305	87	Davis, Otis	USA	TRAC	DEFKOS	6		07/12/1932	8	
30	G:D10	396		Evans, Lee	USA	TRAC	DFKOST	6		02/25/1947	12	+
31	G:A01	930		**Faggin, Leandro**	ITA	CYCL	DFHKOS	6		07/18/1933	35	
32	G:D06	159		Famose, Annie	FRA	**SKII**	DFHKMS	6	F	06/16/1944	11	+
33	G:D10	434		Foreman, George	USA	**BOXI**	BFHKRS	6		01/10/1949	22	
34	G:D10	440		**Foyt,** Anthony Joseph	USA	AUTO	BCDESX	6		01/16/1935	3	+
35	G:D10	474	129	Gibson, Althea	USA	TRAC	BFJSTX	6	F	08/25/1927	3	+
36	G:D10	548		**Hansen,** Fred	USA	TRAC	DKOSTX	6		12/29/1940	36	+
37	G:A01	46		**Jazy,** Michel	**FRA**	TRAC	DFKOST	6		06/13/1936	29	
38	G:D10	661	181	Johnson, Cornelius	USA	TRAC	DKOSTX	6		08/21/1913	4	
39	G:D10	701		**Kidd,** Billy (William)	USA	**SKII**	DHKMSX	6		04/13/1943	14	
40	G:A01	2064		**Lenglen,** Suzanne	FRA	TENN	BDEJKS	6	F	05/24/1899	12	+
41	G:D06	279		Maspes, Antonio	ITA	CYCL	DFHKOS	6		01/14/1932	27	
42	G:A01	857		**Michard,** Lucien	FRA	CYCL	DGHKOS	6		11/17/1903	9	+
43	G:D10	927		Morrow, Bobby	USA	TRAC	DKOSTX	6		10/15/1935	2	+
44	G:D10	962		**O'Brien,** Parry	USA	TRAC	DEKSTX	6		01/28/1932	20	
45	G:A01	2024		**Perillat,** Guy	**FRA**	**SKII**	DFHKMS	6		02/24/1940	11	+
46	G:A01	865		Petit-Breton, Lucien	FRA	CYCL	DFGHOS	6		10/18/1882	28	
47	G:D10	1113	300	Ryun, James Ronald	USA	TRAC	BDKSTX	6		04/29/1947	18	
48	G:D10	1138	307	Schollander, Donald	USA	SWIM	DEFKSX	6		04/30/1946	2	+
49	G:D10	1148		**Seagren,** Robert	USA	TRAC	DKOSTX	6		10/17/1946	15	
50	G:D10	1271	358	Thomas, John	USA	TRAC	DEKOTX	6		03/03/1941	30	

Appendix 3

Screening Sources Applied to Obtain Citation Frequency Indicators

(Character codes as used in the table of "First 50 top athletes," Appendix 2, column "Cit. in.")

1. Chambe, R. (1980). *Histoire de l'aviation.* Paris: Flammarion (A).
2. Chany, P. (1975). *La fabuleuse histoire du cyclisme.* Paris: O.D.I.L. (O).
3. Cimarosti, A. (1973). *Auto-Rennsport. Grands Prix, Wagen, Piloten, Formeln.* Stuttgart: Hallwag (C).
4. Faßbender, H. (1984). *Sporttagebuch des 20. Jahrhunderts.* Düsseldorf: Econ (F).
5. Garcia, H. (1973). La *fabuleuse histoire du rugby.* Paris: O.D.I.L. (O).
6. Gordon, R., & Goldman, H. G. (1981). *The Ring. Record book and boxing encyclopedia.* New York: Atheneum (R).
7. Gronen, W., & Lemke, W. (1978). *Geschichte des Radsports, des Fahrrads.* Eupen: Doepgen *(G).*
8. Kamper, E. (1975). *Lexikon der 12000 Olympioniken. Who's who at the Olympics* (Mit Supplement fur die Olympiade 1976). Graz: Leykam (K).
9. Le Roy, B. (1973). *Dictionnaire encyclopédique des sports, des sportifs et des performances.* Paris *(D).*
10. Newman, G. (Ed.). (1979). *The concise encyclopedia of sports* (2nd revised ed.). New York: Watts (E).
11. Parienté, R. (1978). *La fabuleuse histoire de l'athlétisme.* Paris: O.D.I.L. (O).
12. Rethacker, J.-P., & Thibert, J. (1974). *La fabuleuse histoire du football.* Paris: O.D.I.L. (O).
13. *Skiweltmeisterschaften St. Moritz* (1974). Zürich: Wyss (M).
14. Soderberg, P., et al. (Eds.). (1977). *The big book of Halls of Fame in the United States and Canada.* New York: Bowker (X).
15. Sporthöhepunkte (1980). München: Pro Sport (H).
16. *Stars des Sports* (1970). Die Stars des Sports von A–Z. Berlin: Habel (S).
17. Sudres, C. (1984). *Dictionnaire du cyclisrne. Paris:* Calmann-Levy (Y).
18. Tennis-Jahrbuch (1984). Amtliches Tennis-Jahrbuch des Deutschen Tennis-Bundes (J).
19. Umlauf, L. V. (Ed.). (1980). *The World Almanac of Who. The most important, famous, and interesting people of all times.* Leiceister: Windward *(B).*
20. Watman, M. (1981). *Encyclopaedia of track and field athletics.* New York: St. Martin (T).
21. *World Cup* (1974). München: Pro Sport (W).