surprise that hypnotized subjects were able to live out experiences appropriate to a suggested date in the future as well as in the past. Kline (*3*) has described the administration of psychological tests to subjects to whom advanced ages were suggested, and he felt that their performances on these tests were appropriate to these age levels. It occurred to us that, if a hypnotic subject could vividly live out and describe in great detail the events of a "future" time suggested to him, this experience could cast doubt on the validity of hypnotic regression to a time in the past. If "progression" is a fantasy, maybe regression is also a fantasy.

We have been working with a group of five easily hypnotized subjects, all of whom are capable of deep hypnosis with amnesia in which they are able to relive vividly past experiences. We find that all our subjects consistently and without exception are also able to live out "future" experiences when an age or date is suggested to them under hypnosis. For example, a medical student is told while he is in hypnosis that it is the afternoon of a day in October, 1963. The experimenter then asks:

Where are you now?

(Sighs) I'm pretty busy, got an emergency case that just came in—abdominal obstruction. This one's pregnant too, lot of complications. And we're in her abdomen right now. And I just don't have too much time to talk. (Describes patient's abdominal cavity.) I managed to get this diagnosis, which I was pretty happy about. (Describes presenting symptoms of patient and the resultant diagnosis.) It's mostly adhesions—a number of adhesions especially down in the lower right quadrant. Think all we have to do is go ahead and release these adhesions, but we found two spots in which there was a definite obstruction.

You did a good job of diagnosing this.

Yeah. I was kinda glad to hit the diagnosis. (Describes similar cases encountered in 1958; shifts back to description of operation.) No ulcer. Close her up! Oh, she'll be all right.

All of our subjects live out "future" events in their lives with equal verisimilitude to their accounts of the past. Their futures sound possible and well within the realm of probability, as judged from a careful personality study made prior to this investigation. Our subjects did not attempt to describe events outside their own lives, except in a most vague fashion. Their accounts of the future frequently contradicted their present plans and daydreams and sometimes include conflictual and traumatic experiences. For example, one subject, told that it was a late afternoon in October, 1963, portrayed her grief at the recent death of her 3-month-old son.

We believe that each of our subjects, to please the hypnotist, fantasied a future as actually here and now. We suggest that many descriptions of hypnotic regression also consist of confabulations and simulated behavior. We suspect, however, that our doubts do not apply to the reenactment of traumatic past experiences; that is, we feel that there is a great difference between asking a subject "regressed" to the age of 10 to describe a relatively uneventful day and his spontaneously dissociating and reexperiencing the death of his father under tragic circumstances (*4*).

We are now engaged in investigating this phenomenon. In addition to its relevance to hypnotic regression and to the whole problem of memory, we feel that it offers us a method of studying fantasies and daydreams and all the facets of personality evoked by a projective technique.

Summary. We have observed an experience that has been regularly elicited in a group of hypnotic subjects. This consists in their living out and describing the events of a future date or age suggested to them. We believe that this challenges the validity of hypnotic regression to a nonconflictual time in the past.

References and Notes

1. M. S. Bergmann, H. Graham, and H. C. Leavitt. *Psychosom. Med.* **9**, 20 (1947).
2. M. T. Orne. *J. Abnormal Social Psychol.* **46**, 213 (1951).
3. M. V. Kline. *J. Genet. Psychol.* **78**, 195 (1951).
4. M. H. Erickson. *Arch. Neurol. Psychiat.* **38**, 1282 (1937). This is a remarkable account of a patient who regressed to, and lived out, an amnesic experience in which he developed apparent unconsciousness from a beating and possible narcosis, which Erickson was later able to document from hospital and police records of that time.

Received February 8, 1954.

Communications

Sex Ratio and Parental Age

M. E. Bernstein, in *Science* **118**, 448 (1953), criticizes an article by the present writer that appeared in an earlier number [*Science* **117**, 531 (1953)]. The conclusion in my note was simply that the well-known change in sex ratio with increasing age of the parents could be attributed to the change in age of the father, the data indicating a linear relationship between the two. Her criticisms include the following points: (i) that the data are not linear; (ii) that there is a similarity between abortion rate versus age curve and sex ratio versus age curves; (iii) that the ages of husband and wife are positively correlated; and (iv) that the data were unstratified and that data of hers from the "upper social strata" show no such age effect.

Of these objections, the third would be most serious if it were valid. Of course, the ages of husband and wife are positively correlated, and it is for just this reason that partial regressions were used. This method allows for the correlation mentioned and leads to the conclusion that, in our data, the age of the father is more directly related to the variation of sex ratio than the age of the mother. It is not true that Ciocco denies this possibility; he is correctly quoted by Bernstein as writing that his data "cannot be used to support any such conclusion." The later extensive data in my article

do offer substantial support. Furthermore, two other methods had been used to remove the correlation between the ages of spouses, in order to check the result from the regression analysis. One of these, the path coefficient method of Wright, was explicitly mentioned.

It is charged that the data are not linear. This is not true. The data are linear in the only sense in which data can be said to be linear: the deviations from linearity are not statistically significant (despite the large sample size of more than 9 million births). However, it can be assumed that when more extensive data become available, the change in sex ratio with age, like biological phenomena in general, will prove to involve some nonlinear component. This may then be considered a logical extension and refinement, but hardly a refutation, of the linearity reported in my communication.

It is possible that differences in abortion rates contribute to the trend, even though Ciocco, whom Bernstein cites in another connection (see above), concluded that this cannot be the only factor [*Human Biol.* **10**, 36 (1938)]. No opinion was expressed on this question in my article.

No age effect of the approximate magnitude of that reported in my article, a decrease of seven male births per 10,000 births per 5-yr increase in age of the father, could possibly be demonstrated in the numerically small sample obtained from a 1935 German "Who's Who" and Radcliffe College Alumnae by Bernstein, despite the interest of her sample in other connections. However, I agree that the effects of different strata on results obtained from an analysis of combined data constitute an important and troublesome problem, one that should be circumvented where possible. Because of the great difficulty of obtaining sufficiently extensive selected data for testing the effects of parental age on sex ratio, it seems worth while to obtain as much information as possible from data that are actually available.

E. NOVITSKI

University of Missouri
Columbia

Received January 26, 1954.

Owing to an editorial oversight, Dr. Novitski unfortunately was not given the opportunity to see Marianne E. Bernstein's communication prior to its publication.

Geologic Controls of Lead and Zinc Deposits in the Goodsprings (Yellow Pine) District, Nevada

Lead-zinc ore of the Goodsprings (Yellow Pine) district typically occurs as flat pipes and tabular bodies replacing dolomitized limestone in zones of fracturing and brecciation. About 98 percent of the combined lead and zinc output has come from one formation, the Monte Cristo limestone of Mississippian age, which averages only 700 ft in thickness. Of the five members into which this formation has been subdivided—the Dawn limestone, Anchor limestone, Bullion dolomite, Arrowhead limestone, and Yellowpine limestone, named in ascending order—the Anchor and Yellowpine have been most productive, the latter having accounted for about 85 percent of the production. Because of the irregular surface of the unconformity separating the Monte Cristo limestone from the overlying Bird Spring formation of Pennsylvanian age, the Monte Cristo varies in thickness and, in some places, one or more of its members are missing.

The areal distribution of ore bodies is related to a complex pattern of faulting. The terrain is divided by thrust faults into imbricate blocks from 1.5 to 3 mi thick. These faults trend generally with the strike of the beds, but in most places their dip exceeds the dip of the bedding. Blocks bounded by the principal thrusts are intricately broken by smaller thrusts and high-angle faults, many of which apparently represent rifts and tears. Reefs of breccia border many faults, but the effects of brecciation and fracturing vary with the character of the beds involved. Massive limestone yielded to deformation largely by fracturing; thin beds, more by gliding and flowage. Thus, the Monte Cristo limestone, a comparatively massive unit between thinly bedded units, is complexly fractured at many places where the overlying Bird Spring formation remains relatively intact.

Chiefly because of this fracturing, the Monte Cristo limestone became the host for most of the ore bodies. Results of detailed studies of 17 mines suggest that the mineralizing solutions rose along conduits opened by intersection of faults and joints, or by differential movement along arcuate faults. Locally, the breccia along the feeding fissures was mineralized; more commonly the ore formed in permeable ground marginal to the fissures. The high permeability of the Monte Cristo limestone favored lateral spreading of fluids and sulfide replacement of limestone or dolomitized rock. In some places, the paths of maximum permeability were partings between beds or sandy fillings in old caves; more commonly they were zones of fractured ground along flexures or faults. Relatively impermeable bodies of mudstone and altered porphyry, as well as films of clayey gouge along thrust planes, locally contributed to the formation of ore by retarding upward progress of fluids.

Beneath some of these impermeable caps, the ore remains unaltered and consists principally of galena and sphalerite. In most places, however, the ore is oxidized to undetermined depths below present mine workings. Sphalerite has been altered to hydrozincite and calamine. Locally, the galena has also been altered —to cerussite or less commonly to anglesite—but mostly it remains as scattered pods and lentils in the oxidized ore. This common association of the primary lead sulfide with the secondary zinc carbonate and silicate indicates that the oxidation of primary ore was accomplished without significant change in position or shape of the ore bodies.

Prospecting in the district was begun in 1857. The